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OCTOBER 1942

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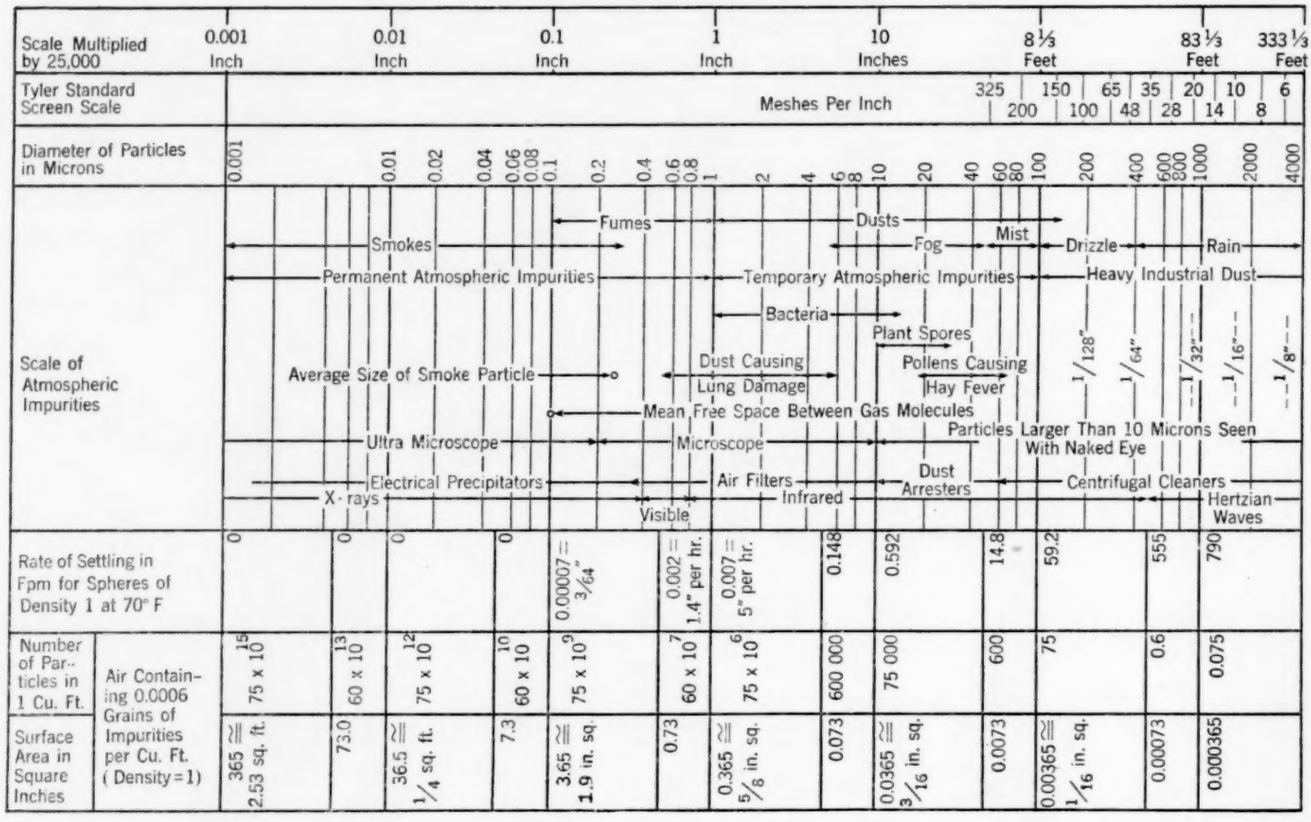
CORRECTIONS

Monthly Weather Review, June 1942, vol. 70: Page 125, the symbol "„" for Seattle, Wash., and Eugene, Oreg., should be "‥" [continuous light rain]; page 126, 1st column, next to bottom line, "directions" should be "direction"; page 127, the symbol "⊘" at Caribou, Maine, should be "⊘]."; page 141, table of crest stages in Mississippi and Missouri River basins, crest stage for St. Louis, Mo., "24.3" should be "24.5"; page 142, table of Flood-Stage Report, same correction.

Monthly Weather Review, July 1942, vol. 70: Page 160, table of Flood-Stage Report, crest stage for St. Louis, Mo., "24.3" should be "24.5".

THE DUST SPECTRUM



MONTHLY WEATHER REVIEW

Editor, EDGAR W. WOOLARD

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OCTOBER 1942

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A STUDY OF ATMOSPHERIC POLLUTION

By W. F. DAVIDSON

[Research Engineer, Consolidated Edison Company of New York, Inc., June 1942]

In an earlier paper [1] a description was presented of an improved Owens automatic air filter and associated instruments that had been developed for use in making a survey of atmospheric pollution. The present paper describes the survey in more detail and will offer certain suggestions, based on this experience, for the conduct of other investigations.

The survey was undertaken in an effort to determine the extent to which dust emitted from the chimneys of power houses and gas manufacturing plants within the city contributed to the general atmospheric pollution of the city. There were certain intentional limitations on the original scope while other limitations became apparent as a result of the survey.

In the first place, the study was restricted to the measurement of suspended dust which is here understood to include only solid particles of such size that their settling rate in the atmosphere is not greatly different from the vertical components of air velocity associated with normal turbulence. The measurements of dust concentration were to be determined primarily by the measurement of shade number in the modified Owens recorder, although provision was made, as will be discussed later, for converting the observations to weight loading such as tons per cubic mile. The selection of meteorological data to be used in the survey was, to a considerable degree, arbitrary and restricted to the obvious factors of wind velocity, wind direction, temperature in the shade, and humidity.

The determination of the number of observation stations and their location presented a difficult problem involving the necessity of choosing between a small number of stations with the corresponding increase in cost and the large increase in the complexity and difficulties of the statistical analyses. The final decision was to use eight observation stations located as shown in the outline map, figure 1. Effort was made in the final placing of the recorders to get them at points generally above prevailing roof levels in the area so as to be reasonably free from major erratic variations in wind conditions. The levels of the observation points above sea level and above the street are summarized in table 1.

Since data on wind direction and velocity were required, it was decided to install two Friez recording wind direction velocity stations, designated as A and B in table 1, rather than to call on the Weather Bureau for the special services that would be involved in making promptly available the large number of observations. Data on air temperatures and humidity were obtained from the daily Weather Bureau records.

The dust samplers were adjusted to operate at the hour and half-hour. During the early part of the survey, they were checked at least once a week, and later this interval was extended to about 3 weeks. The records, after removal from the machine, were examined, checked, and marked for identification and then assembled into strips filling a 400-foot 16-mm. motion picture film reel. For measuring the records, the scanner or photoelectric densitometer was placed on a typewriter desk with the control

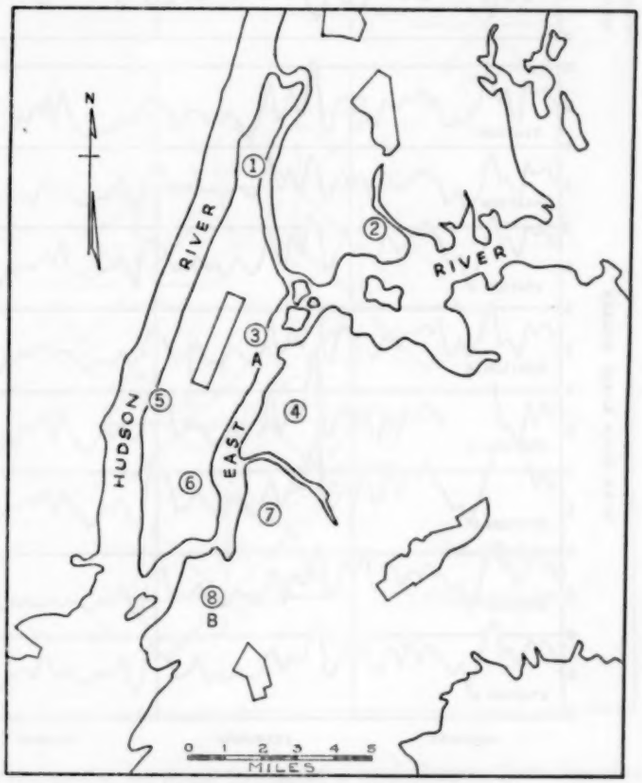

FIGURE 1.—Location of recording stations.

push-button near the keyboard and the meter conveniently located. A tabulating form was arranged with 48 columns—one for each half-hour with one line for each day so that entries were made across the page line by line. Shade numbers were recorded in the nearest unit, although the instrument readings were reproducible to better than one-half unit. With these facilities an operator after a little experience could measure and enter on the data sheet about 3,000 observations during the normal working day. With eight stations, about three days per month were needed for this phase of the study.

The enormous volume of data—about 200,000 observations of shade number and 50,000 observations of wind

[1] W. F. Davidson and Warren Master—Automatic dust sampling and analyzing instrument for atmospheric pollution surveys—MO. WEA. REV., Sept. 1941, 69: 257–260.

velocity and direction for an 18 months' survey—made the use of machine tabulating methods almost imperative. Accordingly, meteorological and dust (shade number) data were transcribed to Hollerith cards. One card was prepared for data for each half-hour period with entries showing the shade number for each of the eight stations and the wind velocity and direction for each of the two wind stations and the air temperature in the shade and the humidity. This made a total of 48 cards per day or 1,440 per month—about 1 day's work per month for the key-punch operator.

The various steps by which the cards were put through the sorting and tabulating machine will not be described, as the exact processes are of no immediate interest. Of the many analyses that were tried, only a few gave evidence of useful correlation to be extended to the entire survey.

Typical tabulations are presented here for two representative months, namely July 1939 and January 1940. These are table 2—Daily Station Averages—Suspended Solids Expressed as Mean Shade Number; table 3—Mean Shade Number by Hour; table 4—Mean Shade Number for Each Wind Velocity and Time Distribution of Wind Velocities; table 5—Mean Shade Numbers for Each Wind Direction and Time Distribution of Wind Direction. Other data were prepared in the form of charts which will be discussed later.

Examination of any of the tables emphasizes immediately the enormous difficulties in the way of interpreting the data. Variations from day to day and from hour to hour are often large and have no simple explanation. The futility of attempting to make sound conclusions on the basis of a limited number of observations, especially if they are made at a single location, thus becomes more apparent.

Figure 2 shows a portion of a chart plotting daily average values of shade number, together with wind velocity and direction and daily mean temperature data. It is evident that any relations that may exist between these various factors are by no means simple. However, there is a suggestion that there may be a useful correlation between wind velocity and shade number and this is further borne out by the charts of figure 4. In these the data for each month have been plotted on double logarithmic scales. There is a clearly indicated relation that the shade number (dust concentration) varies inversely as the square-root of the wind velocity. The correlation coefficient is 0.989. The explanation for this will probably be found to involve atmospheric turbulence, but we have not attempted to study the problem in detail.

Several attempts were made to make use of this empirical relationship in the adjustment of other data, but it did not seem practical to go beyond the arrangement of the data in table 5 where distinction is made between shade

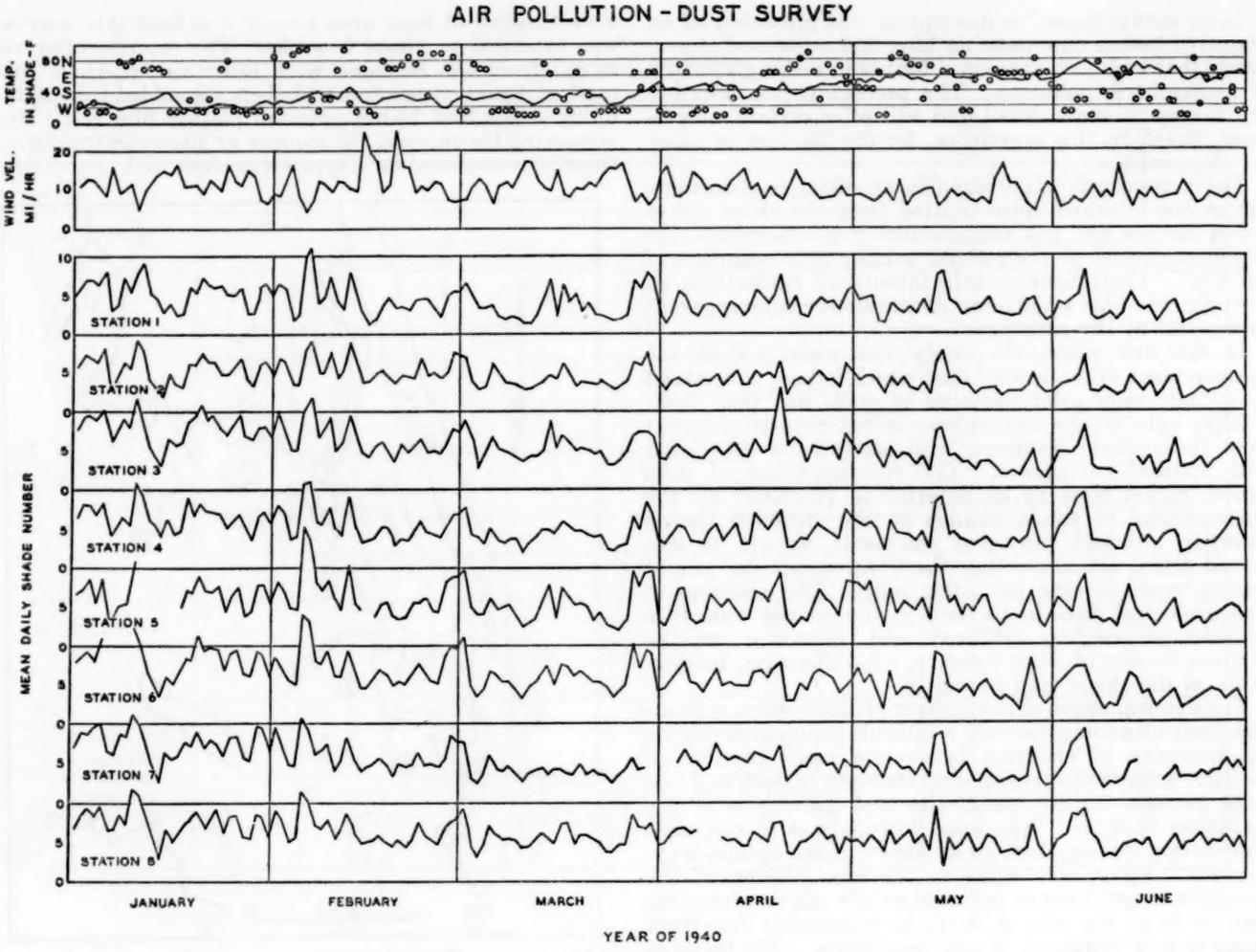

FIGURE 2.

number observation when the wind velocity was less than 7.5 miles per hour and observations when the wind velocity was greater than 7.5 miles per hour.

Since the chief purpose of the survey was to determine the extent to which specific power stations might contribute to the general atmospheric pollution, further analysis was necessary. Several earlier investigators had made use of maps on which they plotted some function of dust concentration and wind velocity, such for instance as the "shade-miles" used in some earlier studies of the New York area. The typical charts of figure 3, for the months of July 1939 and January 1940, show a somewhat different method of analysis. In these, an outline map is used as a base with the location of the various observation stations indicated by appropriate numbers. Radial distances are then plotted from each central point in such a way that the length is proportional to the average shade number, using the scale shown on the chart, while the wind is from the direction of the radius and is either less or greater than 7.5 miles per hour. Thus, for January 1940, table 5 shows that at station 1, north winds above 7.5 miles per hour resulted in a mean shade number of 5.0. This is plotted as a radius of 5 units long north (vertically) from station 1. The other radial lines are similarly plotted and the ends of these are connected by a series of straight lines forming closed polygons. Where no line is drawn it indicates that there were no observations for that condition. As would be expected from the relation between wind velocity and shade number, points for low wind velocities lie outside those on high wind velocities. Extension or bulge of the polygon in any direction indicates that some principal sources of atmospheric dust lie in that direction, but great caution must be exercised in drawing any conclusions for the data as presented do not take any account of the relative duration of the specific conditions.

To illustrate one way in which these charts have been used, consider the data for January 1940 and assume the condition of a north wind of less than 7.5 miles per hour. Shade number for station 1 is 6.9 and we assume that this represents the concentration of dust originating in the area north of this station. Now, if we follow the chart to the south, we come to station 3 and observe from the chart that the shade number is 8.5 or an increase of 1.6 numbers above that at station 1. Accordingly, it would appear that an amount of dust equivalent to 1.6 shade numbers had been released to the atmosphere in the zone between stations 1 and 3. Going still further south, we reach station 7 and observe that the shade number has there risen to 11.3 and, again, we assume that dust equivalent to 2.8 shade numbers has been released in the zone between stations 3 and 7. All this makes a consistent story. Now assume the case of an east wind and take stations 4 and 5. At station 4, the shade number is 10.9 while at station 5, it is 8.5 or a reduction of 2.4 shade numbers, which would indicate that dust, instead of being released in the atmosphere in this part of the city, is being precipitated

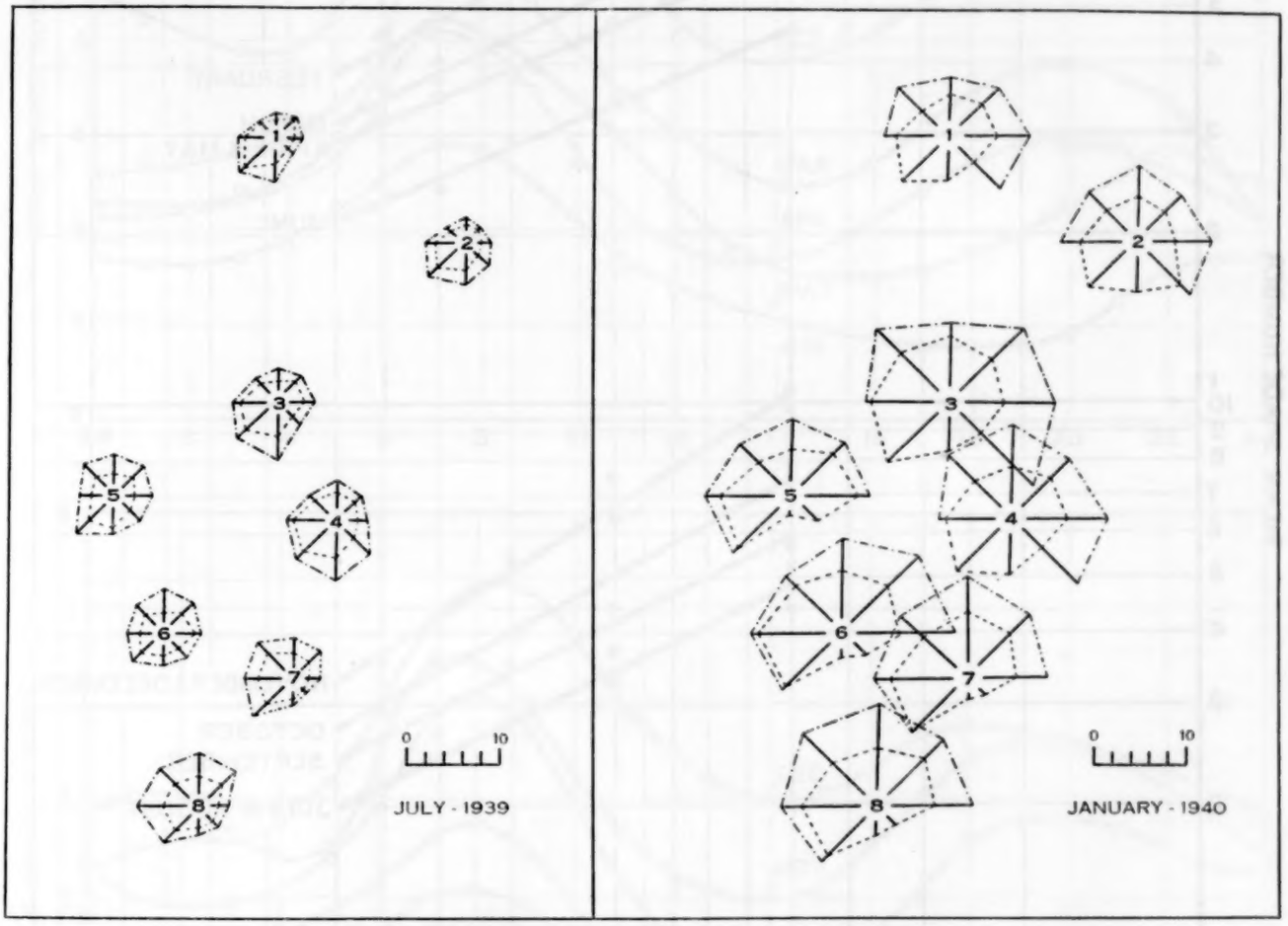

FIGURE 3.

out. Such a situation is undoubtedly possible, but the fact that it can exist must serve as a reminder that caution, and a very considerable measure of judgment, are necessary for the interpretation of the data.

Another approach to the problem of analysis and interpretation is to take the chart of figure 5 which shows the hourly variation of mean shade number for each month. (In plotting this the time is prevailing time.) It will be noted that for every month there is distinct maximum occurring near 8 a. m. and that there is a second maximum, but not quite as high between 6 and 8 a. m. in the winter months. In the summer months—June to September—the low point for the day occurs between 4 and 6 p. m. Having in mind the correlation between shade number and wind velocity previously mentioned, it is possible to adjust the observed data to correspond to the average wind velocity. This has been done and it has been found that it reduces the morning maximums by a little less than 0.8 shade number (for winter) and that it increases the summer afternoon minimums by about 0.2 shade number. Clearly the effects of wind velocity afford only a partial explanation.

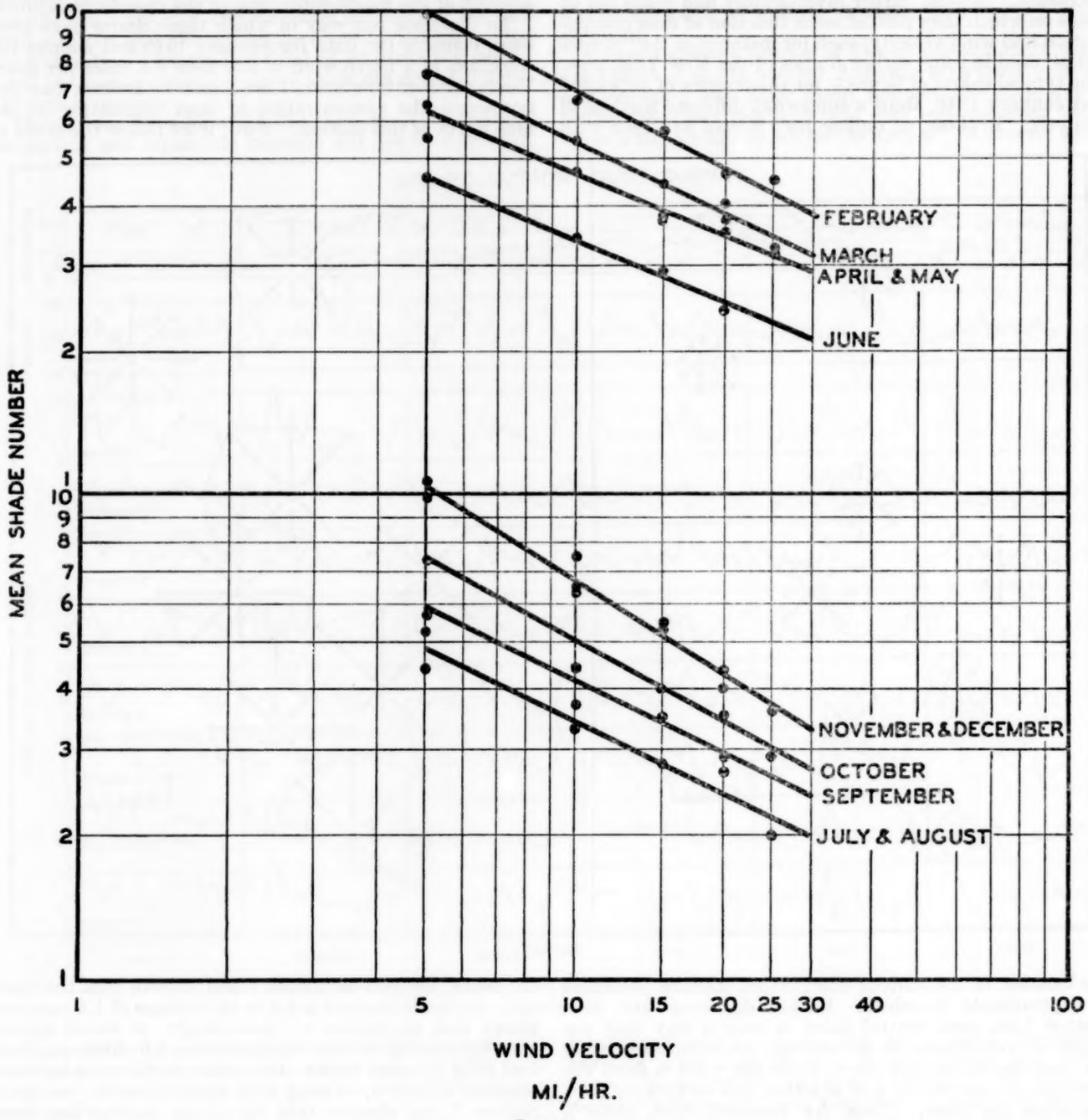

FIGURE 4.

In figure 6 there are plotted the shade number curves for January and July and corresponding representative week-day load curves of the electric utility generating stations. An almost startling feature is that from mid-

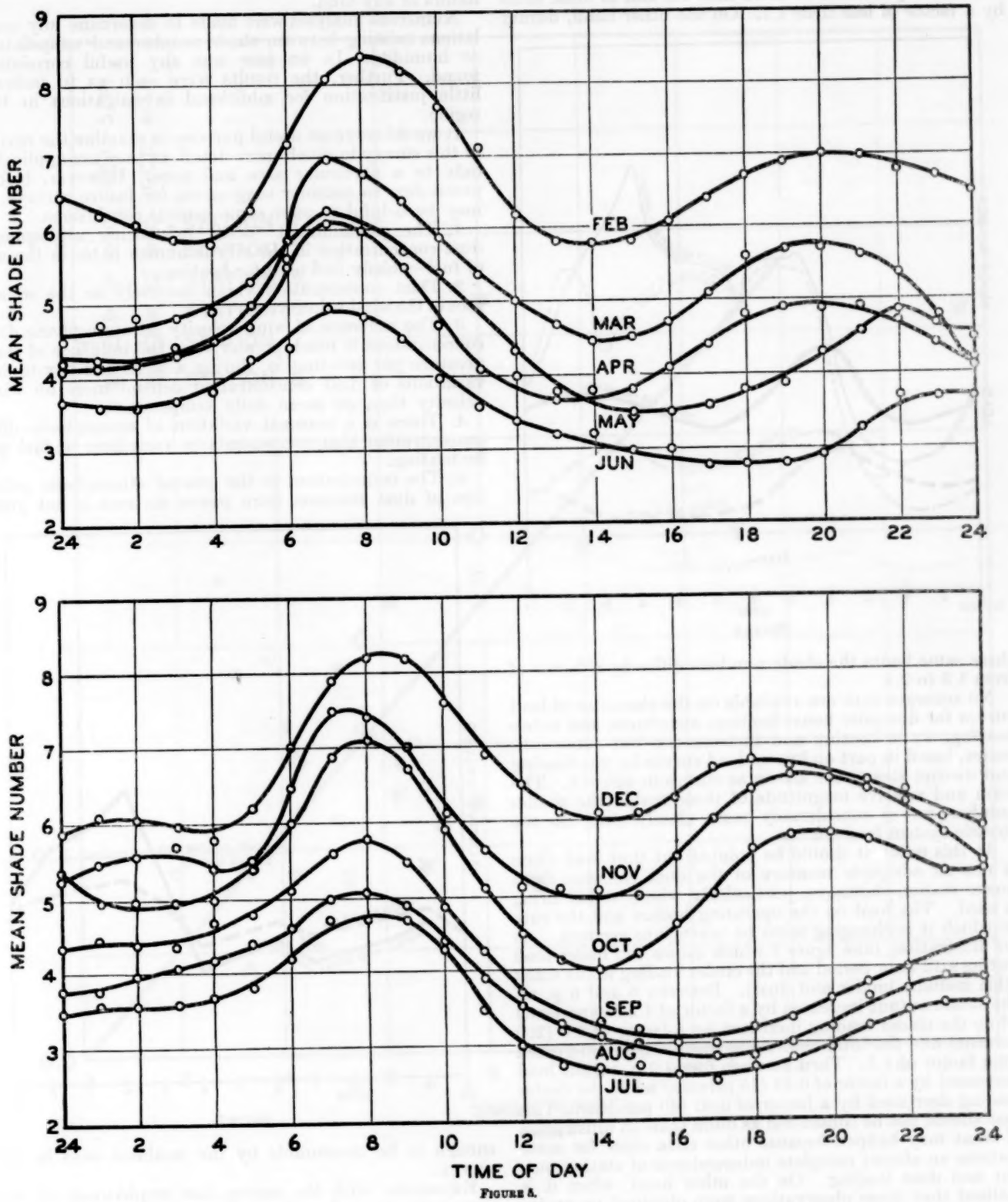
MEAN SHADE NUMBER
9
8
7
6
5
4
3
2
24
2
4
6
8
10
12
14
16
18
20
22
24
FEB
MAR
APR
MAY
JUN
DEC
NOV
OCT
SEP
AUG
JUL
TIME OF DAY

FIGURE 5.

night until 3 in the afternoon and again from 9 in the evening until midnight—or during about 18 hours out of the 24 hours in a day—the winter and summer loads do not differ by a factor or more than 1.5 and in most cases by a factor of less than 1.1. On the other hand, during

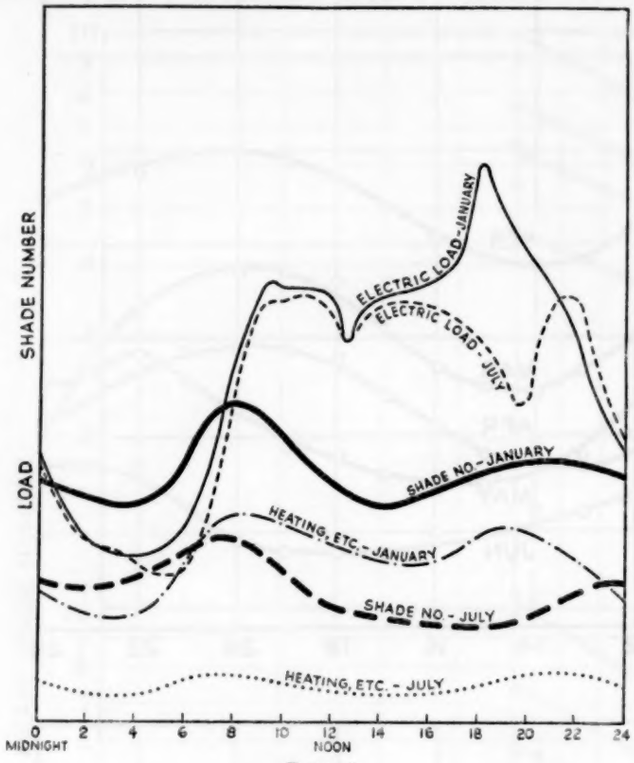

FIGURE 6.

these same hours the shade numbers differ by a factor of from 1.5 to 2.1.

No accurate data are available on the character of load curves for domestic house-heating, apartment and hotel-heating, water-heating and incinerators, but some estimates, based in part on known load curves for gas-heating and district steam, are shown as curves in figure 6. The form and relative magnitude of these match the shade-number curves considerably more closely than do the electric system load curves.

At this point, it should be pointed out that load alone is not an adequate measure of the dust emission from power station chimneys, particularly where stoker firing is used. The load on the operating boilers and the rate at which it is changing must be taken into account. As an illustration, take figure 7 which shows the boiler load during a 12-hour period and the cinder loading in the stack (this includes cinder and dust). Between 4 and 6 p. m. the steam output increased by a factor of 1.5 (50 percent) while the cinder loading increased by a factor of 3.0 (200 percent) and the total cinder and dust emission increased by a factor of 4.5. Then between 6 and 9 p. m. the load decreased by a factor of 0.85 (15 percent) while the cinder loading decreased by a factor of 0.60 (40 percent). This case should not be considered as more than an illustration of what may happen because other data show for some stations an almost complete independence of station output and dust loading. On the other hand, when it is realized that these observations were obtained on an installation which included cinder and dust catchers that were considered as among the best available at the time they were purchased, some idea may be gained as to the possible performance of installations without dust eliminators of any kind.

Numerous analyses were made to determine any corelations existing between shade number and temperature or humidity. In no case was any useful correlation found. Further, the results were such as to indicate little justification for additional investigations in this region.

It would serve no useful purpose to examine the results of this survey in much more detail, as they are applicable only to a particular area and time. However, before proceeding to consider suggestions for future surveys, it may be helpful to offer some general conclusions.

1. The predominant factor influencing atmospheric dust concentration in the city is human habit in the use of fuel—chiefly fuel used for heating.

2. Dust concentration varies inversely as the square root of the wind velocity.

3. The influence of wind velocity on atmospheric dust concentration is much greater than the influence of temperature per se—that is, during a week the day-to-day variations of dust concentration depend more on wind velocity than on mean daily temperature.

4. There is a seasonal variation of atmospheric dust concentration that corresponds to variations in fuel use for heating.

5. The contribution to the general atmospheric pollution of dust emission from power stations is not great

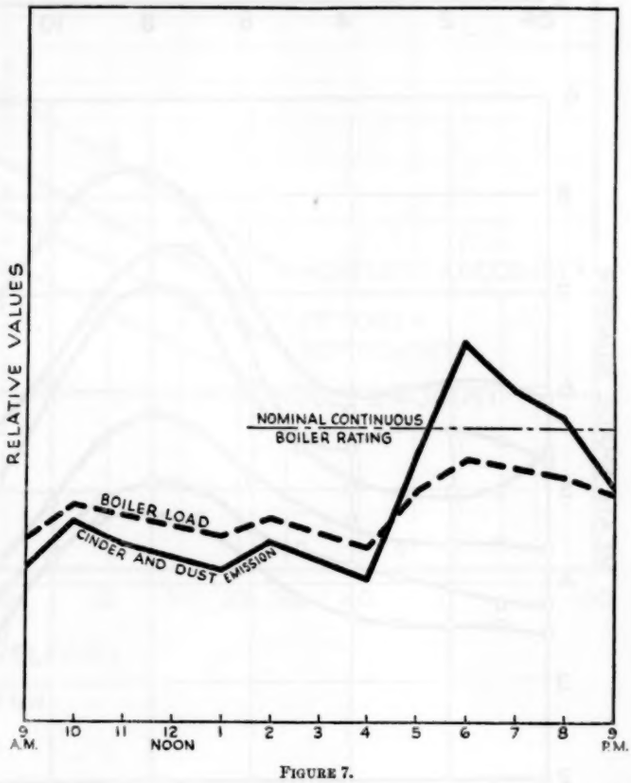

FIGURE 7.

enough to be measurable by the methods used in this survey.

Experience with the survey has emphasized—if that were necessary—the extreme complexity of the atmospheric pollution problem, and it has also shown how

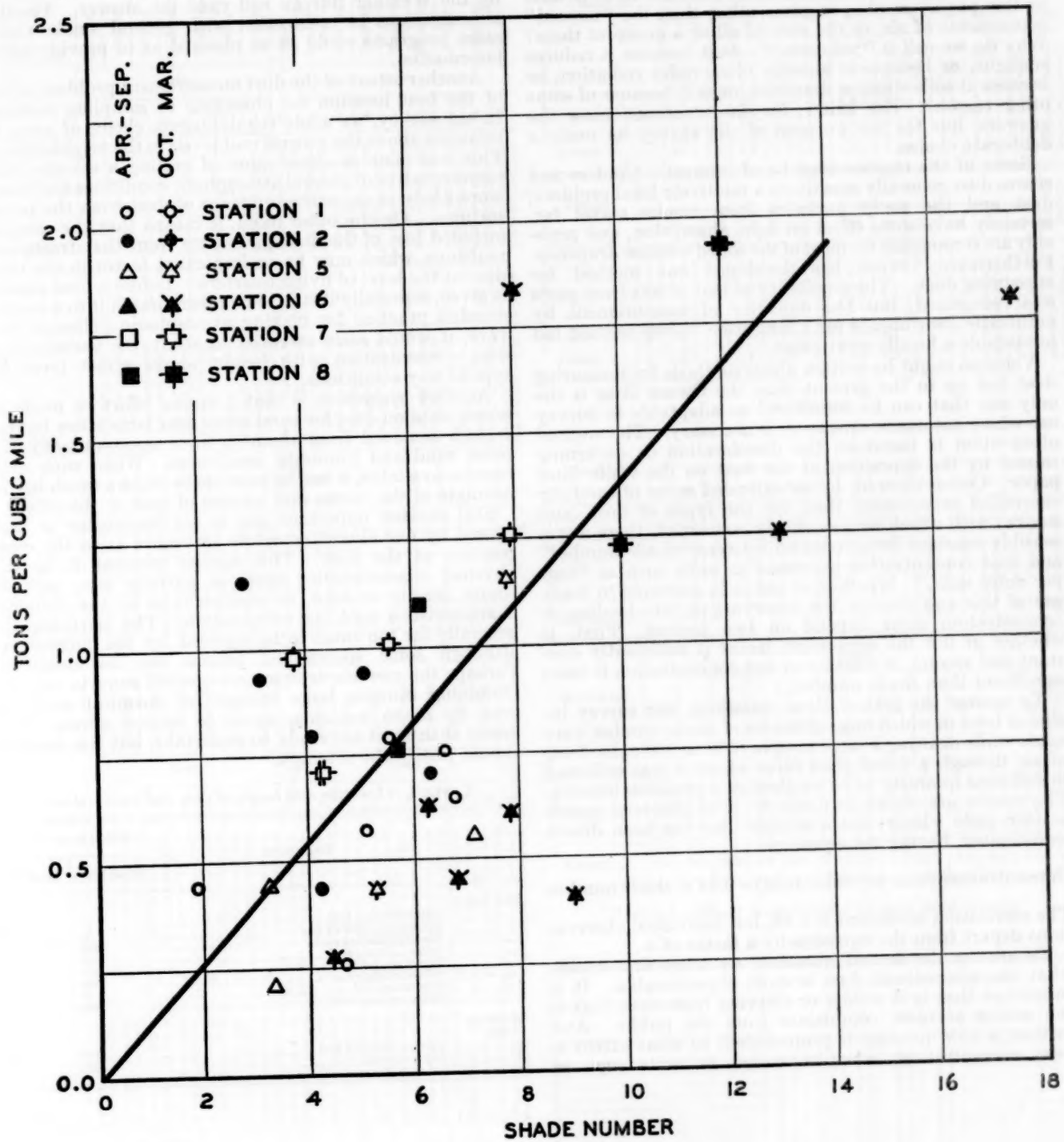
APR.-SEP.
OCT. MAR.
STATION 1
STATION 2
STATION 5
STATION 6
STATION 7
STATION 8
TONS PER CUBIC MILE
SHADE NUMBER
0.0
0.5
1.0
1.5
2.0
2.5
0
2
4
6
8
10
12
14
16
18

FIGURE 8.

incompletely many of our ideas are formulated. The remaining part of this paper will be devoted to some discussion of a few of the many problems.

As a start, what do we mean by atmospheric pollution? Is it cinders, or dust (in the sense that the term is used in this paper) smoke, or gases other than the "normal" components of air, or the sum of all or a group of them? Why do we call it "pollution"? Is it because it reduces sunlight, or because it absorbs ultra-violet radiation, or because it soils window draperies, or is it because of some other reason? The writer, for one, does not know the answers, but for the purpose of the survey he made a deliberate choice.

Some of the reasons may be of interest. Cinders and coarse dust generally constitute a relatively local problem; dust and the sooty particles from smoke travel far, certainly have some effect on light absorption, and probably are responsible for most of the soiled window draperies. Furthermore, Owens has developed one method for measuring dust. The possibility of bad effects from gases was recognized, but the difficulty of measurement by automatic instruments for a long-time survey seemed too formidable a hurdle to attempt.

Volumes might be written about methods for measuring dust but up to the present time the Owens filter is the only one that can be considered as adaptable to survey use where automatic operation is necessary. The original observation is based on the discoloration or darkening caused by the deposition of the dust on the white filter paper. Owens showed, by an extended series of carefully controlled experiments that, for the types of dust (and smoke) with which he was chiefly concerned, there was a sensibly constant linear relation between "shade number" and dust concentration expressed in units such as "tons per cubic mile." Whether or not it is desirable to make use of this and convert the observations into loading or concentration must depend on two factors. First, is whether or not the conversion factor is sufficiently constant and second, is whether or not concentration is more significant than shade number.

To answer the first of these questions, our survey included tests in which measurements of shade number were made while drawing a large sample (300 to 500 cubic feet) of air through a fitted glass filter where it was collected in sufficient quantity to be weighed on a precision balance. The results are shown in figure 8. The observed points scatter quite widely, but a straight line has been drawn as indicated, having the equation:

$$\text{Concentration (tons per cubic mile)} = 0.14 \times \text{shade number}$$

The correlation coefficient is 0.88, but individual observations depart from the equation by a factor of 3.

To answer the second question, we must first decide what characteristic of dust is most objectionable. It is submitted that it is soiling or dirtying from dust that is the source of most complaints from the public. And further, a new question is propounded: to what extent is dust concentration, when measured in units such as "tons per cubic mile," related to reduction in daylight or ultraviolet radiation? Until an authoritative answer can be given it would seem dangerous to assume that there is a close relationship. It is hoped that studies contemplated by the Weather Bureau will yield the answer. Possibly investigations in connection with general smoke abatement programs could be so planned as to provide useful information.

Another aspect of the dust measurement problem is that of the best location for observing or sampling stations. In our survey, we made the deliberate choice of going to locations above the general roof levels in the neighborhood. This was done in expectation of getting a sample more representative of general atmospheric conditions and hence more likely to show the influence of dust from the power stations. On the other hand, it means that the samples included less of the dust picked up from the streets and roof-tops, which may be an important factor in the total dust at the level of living quarters. Before a final answer is given, especially if it is to be incorporated into a recommended practice for making atmospheric pollution surveys, it would seem essential to study the variations in dust concentration with height above street level for typical city conditions.

Another suggestion is that a strong effort be made to secure data on dust for rural areas near large cities but far enough removed from them to have approximately the same wind and humidity conditions. When such data become available, it will be possible to make a much better estimate of the causes and sources of dust in the cities.

Still another important gap in our knowledge is that caused by our almost complete ignorance as to the composition of the dust. This applies whether it be the physical characteristics such as particle size, particle shape, density or color, or whether it be by the chemical characteristics such as composition. The particles are generally far too small to be resolved by the microscope, although some spores and pollens can be identified. Perhaps the new electron microscope will come to our aid. Obtaining samples large enough for chemical analysis, even by micro methods, seems to require efforts more heroic than most are ready to undertake, but the rewards should justify the attempt.

TABLE 1.—*Location and height of dust and wind stations*

	Description	Height in feet above	
		Street grade	Sea level
Dust station			
1	Office building roof	80	240
2	Substation building roof	30	40
3	Factory building roof	140	150
4	Office building roof	120	150
5	Top of gas holder	290	310
6	Office building roof	260	300
7	Substation roof	50	60
8	Office building roof	100	160
Wind station			
A	Factory building roof	160	170
B	Office building roof	220	270

TABLE 2.—*Daily station averages of suspended solids expressed as mean shade number*

July 1939

Station No.	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Weekly average	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Weekly average
	Date								Date							
							1		2	3	4	5	6	7	8	
1							2.9	2.8	2.0	3.1	5.1	4.5	3.4	5.1	4.9	4.0
2							2.8	2.5	2.0	2.8	3.5	4.1	3.6	4.6	4.0	3.5
3							2.3	3.1	2.2	3.3	3.5	4.5	4.9	4.8	3.8	3.9
4							4.1	3.9	3.4	3.9	4.6	5.5	4.2	5.2	4.1	4.4
5							4.4	3.9	3.2				3.1	5.2	4.0	
6							2.7	2.6	3.1	3.4	3.0	2.9	2.2	3.2	3.1	3.0
7							4.7	3.4	4.1	4.0	3.8	3.2	2.1	3.0	3.5	3.4
8							5.0	3.0	4.9	3.9	3.1	2.9	2.2	3.0	3.9	3.4
Average							3.6	3.2	3.1	3.5	3.8	3.9	3.2	4.3	3.9	3.7

	9	10	11	12	13	14	15	Weekly average	16	17	18	19	20	21	22	Weekly average
1	3.5	4.4	2.1	3.0	2.6	4.4	2.1	3.2	2.2	2.9	2.8	2.7	2.8	2.7	2.1	2.6
2	3.2	3.3	2.0	2.7	2.4	3.8	1.3	2.7	1.6	2.8	3.3	2.4	2.4	2.5	1.8	2.4
3	3.6	4.5	2.2	3.6	3.0	5.6	1.7	3.5	2.2	3.1	3.4	3.1	3.6	3.4	2.9	3.1
4	4.3	5.8	2.9	4.1	3.3	5.6	2.7	4.1	2.2	3.8	4.0	2.8	3.5	3.5	2.5	3.2
5	3.6	4.1	2.4	3.6	2.8	4.5	3.2	3.5	2.5	3.2	3.8	3.2	4.0	3.9	2.3	3.3
6	3.3	4.5	3.1	4.1	2.1	3.4	2.3	3.3	1.9	3.2	4.1	3.6	3.4	3.2	2.8	3.2
7	4.0	5.5	3.7	5.5	2.6	3.9	4.0	4.2	2.6	3.7	3.8	2.9	2.6	2.4	2.4	2.9
8	4.4	5.5	3.9	4.9	2.4	3.3	2.7	3.9	3.1	3.9	3.8	3.9	3.8	2.4	2.9	3.4
Average	3.7	4.7	2.8	3.9	2.7	4.3	2.5	3.5	2.3	3.3	3.6	3.1	3.3	3.0	2.5	3.0

	23	24	25	26	27	28	29	Weekly average	30	31
1	2.6	5.6	4.1	2.8	1.7	1.7	1.9	2.9	1.6	3.7
2	2.9	5.5	4.0	3.2	2.3	2.1	1.8	3.1	1.8	3.9
3	3.7	6.6	5.2	3.7	3.2	2.4	2.8	3.9	2.7	4.9
4	3.3	6.3	5.0							4.3
5	2.4	6.8	5.8	3.4	2.4	1.9	2.3	3.6	1.8	4.5
6	2.5	4.8	5.5	3.9	2.5	2.6	3.5	3.6	1.7	4.4
7	3.1	5.5	5.3	2.9	1.6	1.3	1.9	3.1	1.5	5.0
8	3.2	5.1	6.5	4.0	1.9	1.8	2.2	3.5	1.7	4.4
Average	3.0	5.8	5.2	3.4	2.2	2.0	2.3	3.4	1.8	4.4

January 1940

Station No.	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Weekly average	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Weekly average
	Date								Date							
		1	2	3	4	5	6		7	8	9	10	11	12	13	
1		5.4	6.8	6.9	6.3	8.3	2.8	6.1	3.9	7.5	5.3	8.2	9.3	5.3	4.7	6.3
2		5.9	7.5	6.9	6.5	8.6	3.1	6.3	4.4	6.4	5.2	9.3	7.7	4.2	3.0	5.7
3		7.8	9.4	9.6	9.0	10.5	6.0	8.5	7.0	9.4	7.7	12.0	9.4	5.8	4.0	7.9
4		6.5	8.2	8.0	6.6	8.5	4.2	6.8	5.3	6.7	5.3	11.1	9.3	6.2	5.5	7.1
5		6.6	7.4	8.7	5.1	8.8	2.7	6.5	4.2	5.4	5.3	11.0	10.3			7.3
6		7.7	8.7	9.1	7.7	11.1		8.3				12.5	10.1	7.5	5.1	
7		7.0	8.9	8.7	9.6	10.2	6.3	8.0	6.1	8.9	8.0	11.4	9.7	6.8	4.8	7.9
8		6.6	8.4	9.5	8.3	9.7	6.2	7.7	6.5	8.5	7.1	11.9	10.8	8.0	5.3	8.3
Average		6.7	8.2	8.4	7.4	9.5	4.5	7.2	5.3	7.5	6.3	10.9	9.6	6.3	4.6	6.3

	14	15	16	17	18	19	20	Weekly average	21	22	23	24	25	26	27	Weekly average
1	2.7	4.1	2.5	2.6	6.3	5.1	7.3	4.4	6.3	6.0	6.4	5.0	5.0	5.9	2.7	5.3
2	2.0	5.2	3.6	3.3	6.2	6.0	7.9	4.9	6.5	6.5	4.9	4.8	5.9	7.0	4.1	5.7
3	2.8	6.7	5.6	6.1	8.8	9.3	11.1	7.2	8.9	9.4	8.0	7.1	8.3	9.9	6.8	8.3
4	3.6	6.3	4.3	4.7	9.2	6.3	8.3	6.1	7.2	7.1	7.1	5.2	6.0	6.9	5.2	6.4
5				4.8	7.3	6.7	9.1		7.0	6.8	7.8	4.3	6.3	7.6	3.9	6.2
6	3.3	6.1	5.0	6.2	8.5	8.4	11.2	6.9	9.3	9.9	9.8	6.6	9.0	9.5	6.3	8.6
7	2.3	6.8	5.6	6.0	7.8	7.1	9.0	6.4	6.9	8.0	7.3	5.7	8.3	8.4	5.6	7.2
8	2.6	6.7	4.9	6.1	7.3	7.8	8.7	6.3	6.5	7.9	9.1	6.0	8.2	8.3	5.5	7.4
Average	2.8	6.0	4.5	5.0	7.7	7.1	9.1	6.0	7.3	7.7	7.6	5.6	7.1	7.9	5.0	6.9

	28	29	30	31
1	2.7	6.1	6.5	4.5
2	3.3	6.2	6.5	4.7
3	6.3	8.0	8.0	6.5
4	3.4	6.4	7.3	5.7
5	4.2	7.8	7.8	5.4
6	6.1	9.6	9.0	6.1
7	5.2	9.8	9.4	6.1
8	5.4	8.5	8.2	5.4
Average	4.6	7.8	7.8	5.6

TABLE 3.—*Mean shade number by hour*

July 1939

Station no.	Hour											
	1	2	3	4	5	6	7	8	9	10	11	12
1	3.6	3.4	3.3	3.1	3.2	3.4	3.8	4.1	3.9	3.5	3.1	2.8
2	3.2	3.0	2.8	2.6	2.7	3.4	4.2	3.6	3.8	3.0	2.9	2.4
3	3.6	3.7	3.4	3.3	3.6	3.8	4.8	5.0	4.5	4.0	3.6	3.5
4	4.6	4.4	4.5	4.7	4.7	4.9	5.0	4.9	4.8	4.3	3.7	3.1
5	4.0	4.0	4.0	4.5	4.3	4.6	5.0	4.7	5.0	4.2	3.4	2.9
6	3.2	3.6	3.5	3.5	3.8	4.3	4.6	4.7	4.7	3.6	3.0	2.6
7	3.1	3.3	3.6	3.6	4.0	4.6	4.9	5.4	5.1	4.2	4.1	3.1
8	3.5	3.4	3.9	3.9	4.1	4.7	5.5	5.2	5.8	4.5	4.1	3.5
Average	3.6	3.6	3.6	3.7	3.8	4.2	4.7	4.7	4.7	4.3	3.5	3.0

Station no.	Hour												Monthly average
	13	14	15	16	17	18	19	20	21	22	23	24	
1	2.5	2.6	2.5	2.4	2.3	2.6	2.8	2.8	3.1	3.4	3.3	3.6	3.1
2	2.4	2.4	2.3	2.1	2.3	2.5	3.0	2.9	3.0	3.3	3.3	3.1	2.9
3	3.0	3.2	3.2	2.9	2.9	2.9	2.8	3.0	3.6	3.7	3.6	3.6	3.6
4	2.8	3.1	3.3	3.3	3.1	3.3	3.3	3.7	4.2	4.3	4.2	4.3	4.0
5	2.5	2.9	2.9	2.7	2.4	2.6	2.7	2.5	2.6	3.0	3.6	3.7	3.5
6	2.5	2.3	2.3	2.4	2.3	2.4	2.4	2.6	2.9	3.3	3.3	3.3	3.2
7	2.7	2.7	2.6	2.8	2.4	2.6	2.6	2.7	3.0	3.0	3.0	3.0	3.4
8	3.1	2.6	2.7	2.6	2.4	2.3	2.6	2.7	2.9	3.0	3.6	3.5	3.6
Average	2.7	2.7	2.7	2.6	2.5	2.7	2.8	2.9	3.2	3.4	3.5	3.5	3.4

January 1940

Station no.	Hour											
	1	2	3	4	5	6	7	8	9	10	11	12
1	4.6	4.4	4.6	4.7	4.7	6.3	6.6	6.8	6.6	6.0	5.5	5.2
2	4.3	4.5	4.4	4.4	4.6	5.8	7.4	7.2	7.4	6.7	6.1	5.6
3	6.3	6.4	6.3	6.3	6.8	8.3	10.2	10.6	10.0	9.5	8.6	8.0
4	5.3	5.6	5.6	5.4	5.9	6.3	7.8	8.2	8.6	7.6	6.9	6.9
5	6.7	6.6	7.5	6.7	7.4	7.5	8.6	8.3	8.1	7.2	6.3	5.9
6	7.3	7.2	7.4	7.8	8.5	9.4	10.5	9.9	9.4	8.9	8.6	8.0
7	6.3	6.2	6.3	6.5	6.8	7.5	9.1	9.9	10.3	9.4	8.7	7.9
8	6.9	6.6	6.4	6.5	6.7	7.2	8.2	8.7	9.2	8.9	8.3	8.0
Average	6.0	5.9	6.1	6.1	6.4	7.3	8.5	8.7	8.7	8.0	7.4	6.9

Station no.	Hour												Monthly Average
	13	14	15	16	17	18	19	20	21	22	23	24	
1	4.8	4.7	5.0	5.3	5.6	6.0	5.9	5.6	6.1	5.7	4.6	4.6	5.4
2	5.4	5.1	5.1	5.3	5.7	6.0	6.1	5.9	6.0	5.7	5.0	4.4	5.6
3	7.2	7.0	7.2	7.7	8.0	8.4	8.5	8.8	8.6	8.0	7.0	6.3	7.9
4	6.4	6.3	6.0	6.2	6.5	6.7	6.3	6.5	6.9	6.4	6.2	5.7	6.5
5	5.3	5.2	5.3	5.7	6.1	6.7	6.7	6.4	6.1	6.5	6.6	6.8	6.7
6	7.2	6.8	6.8	7.1	7.5	7.9	8.2	8.1	7.9	7.5	7.4	7.1	8.0
7	7.4	7.0	6.9	7.4	7.3	7.4	7.3	7.0	7.0	6.9	6.5	6.4	7.5
8	7.4	7.0	7.1	7.3	7.6	7.3	7.3	7.2	6.9	7.3	7.2	6.9	7.4
Average	6.4	6.1	6.2	6.5	6.8	7.0	7.0	6.9	6.9	6.8	6.3	6.0	6.9

TABLE 4.—*Mean shade number for each wind velocity*

July 1939

Station no.	Wind velocity—miles per hour							
	0	5	10	15	20	25	30	35
1	3.5	3.5	3.1	2.9	2.4			
2	4.0	3.4	3.0	2.6	2.5			
3	5.2	4.3	3.6	3.0	3.6			
4	10.3	4.7	4.0	3.6	3.2			
5	7.1	4.8	3.2	2.7	3.2			
6	6.7	4.2	2.8	2.6	3.2			
7	4.9	4.6	3.1	2.8	2.7			
8	5.9	4.9	3.2	2.8	3.2			
Average	6.0	4.3	3.3	2.9	3.0			
Percentage of time wind is of given velocity								
1–4	0.4	18.2	51.7	28.4	1.3			
5–8	1.5	24.2	54.1	19.9	0.3			

TABLE 4.—*Mean shade number for each wind velocity*—Continued

January 1940

Station no.	Wind velocity—miles per hour						
	5	10	15	20	25	30	35
1	7.8	6.0	5.1	3.7	3.1	*2.0	*1.3
2	7.8	6.0	5.4	4.3	2.9	*2.0	*1.3
3	11.1	8.2	7.7	6.3	4.9	*2.3	*1.0
4	9.4	6.9	6.2	5.0	3.9	*1.7	*1.3
5	8.9	7.1	5.6	5.7	5.3	*7.3	
6	10.2	8.5	7.4	6.6	4.8	*8.7	
7	10.0	8.1	6.8	5.3	3.1	*6.7	
8	10.4	8.1	6.6	5.4	4.1	*5.7	
Average	9.5	7.4	6.4	5.3	4.0	4.5	1.2
Percentage of time wind is of given velocity							
1–4	6.4	40.9	38.9	12.2	1.3	0.2	0.1
5–8	7.5	46.3	36.9	7.7	1.4	0.2	

*Less than 10 readings.

TABLE 5.—*Mean shade number for each wind direction*

July 1939

For wind velocities below 7.5 miles per hour

Station No.	Wind direction							
	N.	NE.	E.	SE.	S.	SW.	W.	NW.
1	2.8	3.2	2.9	2.8	5.0	5.5	4.1	2.7
2	2.8	2.4	2.7	3.9	4.8	5.6	4.2	2.3
3	3.6	3.6	3.9	3.6	6.4	5.9	4.7	3.3
4	4.5	3.9	3.6	5.2	6.7	6.0	5.4	3.9
5	4.6	4.5	4.3	4.1	4.4	6.0	3.7	4.8
6	4.9	4.7	4.2	3.8	3.7	4.6	3.9	4.4
7	4.6	4.5	3.2	2.5	3.0	6.0	5.1	5.5
8	6.1	6.0	3.3	3.1	3.1	5.5	6.3	5.9
Average 1–4	3.4	3.3	3.3	3.9	5.7	5.8	4.6	3.1
Average 5–8	5.1	4.9	3.8	3.4	3.5	5.5	4.8	5.1
For wind velocities above 7.5 miles per hour								
1	2.0	2.9	2.2	1.9	3.2	5.0	3.7	2.4
2	1.8	2.1	2.1	2.2	3.4	4.2	3.2	2.1
3	2.2	3.0	3.1	2.6	3.9	4.5	3.8	2.6
4	3.1	3.0	2.4	2.7	4.2	4.9	4.6	3.3
5	2.5	2.9	2.4	2.5	3.6	4.1	2.4	2.7
6	2.3	3.4	3.7	2.5	2.5	3.4	2.4	3.8
7	3.0	3.2	2.2	1.8	2.4	4.1	3.7	2.8
8	3.3	3.8	2.3	2.2	2.4	3.8	3.7	3.6
Average 1–4	2.3	2.7	2.5	2.4	3.7	4.6	3.8	2.6
Average 5–8	2.8	3.3	2.6	2.3	2.7	3.9	3.0	3.2

TABLE 5.—*Mean shade number for each wind direction*—Continued

July 1939—Continued

Percentage of time wind is from given direction

Station No.	Wind direction							
	N.	NE.	E.	SE.	S.	SW.	W.	NW.
1–4	10.9	6.0	16.5	9.2	19.7	15.5	9.9	12.3
5–8	4.6	12.0	3.7	20.6	15.9	25.0	5.8	12.4

January 1940

For wind velocities below 7.5 miles per hour

Station No.	Wind direction							
	N	NE	E	SE	S	SW	W	NW
1	6.9	7.7	8.9	*8.0			*6.8	7.8
2	7.8	7.1	8.3	*8.5			*8.4	7.9
3	8.5	11.6	11.7	*13.0			*8.8	11.4
4	10.3	8.9	10.9	*10.5			*7.6	9.5
5	8.7	8.3	8.5			*9.0	9.6	*8.1
6	10.4	*12.2	*12.4			*9.1	10.1	*9.1
7	11.3	9.7	9.1			*8.4	10.3	*10.2
8	11.0	10.4	10.6			*8.7	10.1	*11.3
Average 1–4	8.4	8.8	9.9	10.0			7.9	9.1
Average 5–8	10.3	10.1	10.1			8.8	10.0	9.7
For wind velocities above 7.5 miles per hour								
1	5.0	5.7	5.7	*4.2	4.7	7.3	5.8	4.2
2	5.2	4.7	4.2	*7.2	5.7	7.5	6.3	4.8
3	7.3	6.6	5.8	*5.0	6.0	9.7	8.6	7.6
4	5.8	6.1	6.3	*4.6	6.0	8.3	7.1	5.5
5	5.3	6.5	7.6	*4.0		8.4	7.8	4.8
6	7.1	7.3	6.6	3.7	*2.6	8.8	9.0	7.1
7	7.2	6.8	5.6	2.7	*2.3	8.3	8.3	6.6
8	6.6	7.5	6.6	2.8	*2.9	7.6	7.9	6.6
Average 1–4	5.8	5.8	5.5	5.3	5.6	8.2	7.0	5.5
Average 5–8	6.5	7.0	6.6	3.3	2.6	8.3	8.2	6.3
Percentage of time wind is from a given direction								
1–4	19.5	12.2	8.3	0.5	0.8	5.3	27.9	25.5
5–8	13.8	11.4	9.3	0.7	0.5	4.4	35.6	24.3

*Less than 10 readings.

METEOROLOGICAL AND CLIMATOLOGICAL DATA FOR OCTOBER 1942

[Climate and Crop Weather Division, J. B. KINCER, in charge]

AEROLOGICAL OBSERVATIONS

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees Centigrade, and relative humidities in percent, obtained by radiosondes during October 1942*

Stations and elevations in meters above sea level

Altitude (meters) m. s. l.	Albuquerque, N. Mex. (1,620 m.)				Atlanta, Ga. (300 m.)				Bismarck, N. Dak. (505 m.)				Boise, Idaho (868 m.)				Brownsville, Tex. (6 m.)				Buffalo, N. Y. (221 m.)				Caribou, Maine (191 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	31	838	14.2	44	31	983	15.4	78	31	955	7.0	71	31	918	10.6	58	31	1,014	22.7	90	31	990	10.2	77	27	993	5.7	85
500					31	960	17.3	65									31	958	21.4	84	31	958	10.9	71	27	957	6.9	75
1,000					31	906	15.5	63	31	900	9.3	62	31	903	13.7	53	31	904	18.5	75	31	902	8.7	67	27	901	5.1	70
1,500					31	854	13.1	63	31	847	6.9	59	31	851	12.8	49	31	853	16.6	67	31	849	6.1	68	27	847	3.5	65
2,000	31	802	13.5	44	31	804	10.6	54	31	796	4.0	59	31	801	9.4	49	31	804	14.5	64	31	798	3.5	67	27	796	1.6	58
2,500	31	755	9.9	45	31	757	8.2	49	31	748	0.9	60	31	754	5.6	50	31	758	11.8	59	31	750	1.1	66	27	748	0.5	56
3,000	31	710	5.9	47	31	712	5.6	45	31	703	−2.3	58	31	709	2.4	52	31	714	9.4	54	31	705	−1.4	64	27	702	−1.2	49
4,000	31	628	−1.5	53	31	630	−0.1	42	31	619	−7.9	52	31	626	−3.1	50	31	632	3.4	46	30	621	−6.6	59	27	618	−6.9	41
5,000	31	553	−8.1	55	31	555	−6.0	38	30	544	−14.4	47	31	551	−9.3	45	31	558	−2.5	40	30	546	−12.5	54	27	543	−13.1	41
6,000	30	486	−14.4	54	31	488	−12.4	35	30	476	−21.1	45	29	483	−16.0	40	31	491	−8.8	35	28	478	−19.5	51	24	475	−19.9	40
7,000	30	425	−21.7	50	30	427	−19.4	34	30	415	−28.1	43	29	422	−23.1	45	30	431	−16.0	33	25	417	−26.3	47	24	414	−27.0	39
8,000	28	370	−29.1	49	30	373	−27.0	33	30	360	−35.2	43	28	367	−30.4	44	30	377	−23.0	31	25	362	−33.5	47	22	360	−34.0	39
9,000	26	321	−36.6	48	30	324	−34.5	32	27	311	−41.6	----	26	318	−38.1	44	29	327	−30.2	31	24	313	−40.3	----	22	311	−40.1	----
10,000	25	277	−43.8	----	29	280	−41.6	----	23	269	−47.2	----	24	275	−45.1	----	29	284	−37.7	32	23	270	−46.6	----	21	268	−45.8	----
11,000	25	239	−49.5	----	28	241	−48.3	----	23	231	−52.1	----	24	236	−51.5	----	29	245	−45.5	----	21	232	−51.1	----	21	231	−50.3	----
12,000	23	204	−53.6	----	26	207	−53.8	----	16	197	−55.9	----	24	202	−56.0	----	27	211	−53.4	----	18	199	−54.5	----	17	197	−53.5	----
13,000	23	175	−57.3	----	26	176	−58.2	----	14	168	−57.5	----	24	172	−58.1	----	26	180	−60.5	----	16	169	−56.0	----	16	169	−55.8	----
14,000	22	149	−60.9	----	26	150	−61.7	----	12	143	−58.1	----	23	147	−59.9	----	26	153	−66.4	----	14	144	−57.7	----	14	144	−57.1	----
15,000	21	127	−64.3	----	23	128	−64.8	----	6	122	−59.5	----	23	125	−61.8	----	25	129	−71.4	----	13	123	−59.5	----	11	122	−58.9	----
16,000	21	108	−66.9	----	22	108	−66.7	----	5	103	−60.7	----	21	106	−63.0	----	25	109	−74.8	----	9	104	−61.1	----	10	104	−59.0	----
17,000	21	92	−67.4	----	19	92	−67.1	----					16	90	−63.4	----	23	92	−75.7	----	7	88	−61.1	----				
18,000	19	78	−66.4	----	14	78	−65.6	----					12	77	−61.4	----	22	77	−73.1	----								
19,000	15	66	−65.2	----	5	66	−63.6	----					6	65	−59.8	----	19	65	−69.0	----								
20,000	11	56	−62.8	----													12	55	−64.6	----								
21,000																	8	46	−60.6	----								

Stations and elevations in meters above sea level

Altitude (meters) m. s. l.	Charleston, S. C. (14 m.)				Denver, Colo. (1,616 m.)				Detroit, Mich. (217 m.)				El Paso, Tex. (1,193 m.)				Ely, Nev. (1,908 m.)				Great Falls, Mont. (1,128 m.)				Huntington, W. Va. (172 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observation	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	31	1,015	16.8	90	31	838	9.1	64	31	990	8.6	88	31	882	16.9	52	29	811	7.2	50	31	888	9.0	55	31	997	12.0	86
500	31	959	18.3	65					31	957	10.3	74													31	959	13.5	71
1,000	31	905	15.8	66					31	901	8.1	68													31	904	10.8	68
1,500	31	853	13.2	61					31	848	5.3	65	31	851	17.5	45					31	848	8.6	54	31	851	7.5	72
2,000	31	803	11.0	55	31	800	9.9	60	31	797	2.9	61	31	802	14.0	44	29	802	8.6	48	31	798	5.4	53	31	800	5.0	74
2,500	31	756	8.8	42	31	753	6.7	57	31	749	0.7	55	31	756	10.1	46	29	755	8.0	46	31	750	1.9	56	31	752	2.9	68
3,000	31	712	6.4	39	31	708	3.3	57	31	704	−2.0	54	31	712	6.3	51	29	710	4.5	46	31	705	−1.4	56	31	707	0.8	62
4,000	31	629	0.8	35	31	626	−3.2	56	31	620	−7.7	53	31	629	0.2	53	29	627	−2.1	48	31	621	−7.3	56	31	624	−4.0	55
5,000	31	555	−5.1	32	31	551	−10.4	58	30	544	−13.6	53	31	554	−6.3	52	28	552	−8.4	42	29	546	−13.7	56	30	549	−10.0	50
6,000	30	488	−11.4	28	31	482	−17.2	56	30	476	−20.1	49	31	487	−12.8	48	27	485	−15.3	37	27	478	−20.4	55	30	481	−16.5	46
7,000	29	428	−18.7	28	29	422	−24.4	53	30	416	−27.2	48	31	427	−19.9	44	27	424	−22.6	36	27	416	−27.1	53	30	421	−23.5	43
8,000	27	373	−26.0	26	28	367	−31.9	52	29	360	−34.4	47	30	372	−27.3	43	27	369	−29.7	34	27	362	−34.1	52	30	366	−30.7	41
9,000	25	324	−33.3	26	27	317	−39.8	51	28	312	−41.1	----	28	322	−35.0	43	25	320	−37.7	35	27	313	−41.0	----	30	317	−38.1	39
10,000	23	281	−40.6	----	26	274	−46.6	----	28	269	−47.0	----	28	279	−42.0	----	25	276	−45.0	----	24	270	−47.4	----	30	274	−45.0	----
11,000	21	242	−47.1	----	24	235	−52.7	----	27	231	−51.9	----	28	240	−48.6	----	24	237	−50.4	----	24	232	−53.0	----	30	235	−51.1	----
12,000	19	208	−52.4	----	23	201	−57.3	----	23	198	−55.6	----	25	206	−54.7	----	24	203	−54.6	----	23	198	−56.6	----	29	201	−55.8	----
13,000	17	178	−56.4	----	23	171	−60.2	----	21	169	−57.8	----	24	176	−59.7	----	21	174	−57.0	----	23	169	−58.7	----	24	172	−59.2	----
14,000	15	152	−60.6	----	20	146	−62.3	----	16	144	−59.4	----	22	149	−64.4	----	20	148	−59.7	----	23	144	−59.4	----	18	146	−61.9	----
15,000	15	129	−64.0	----	18	123	−63.9	----	14	122	−61.4	----	20	126	−68.3	----	20	126	−61.5	----	22	123	−60.3	----	16	124	−65.0	----
16,000	14	110	−66.6	----	16	105	−65.1	----	8	104	−61.6	----	15	106	−70.8	----	19	107	−63.0	----	21	105	−61.4	----	15	105	−65.6	----
17,000	8	94	−66.2	----	15	89	−65.4	----					12	89	−71.3	----	15	90	−63.5	----	18	89	−61.5	----	11	89	−65.5	----
18,000	6	79	−64.0	----	10	75	−65.1	----					7	75	−70.1	----	10	76	−62.8	----	14	75	−60.9	----	6	76	−65.5	----
19,000					6	64	−64.0	----					6	62	−67.6	----	6	64	−61.3	----	8	64	−60.2	----				
20,000													5	52	−63.7	----												

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees Centigrade, and relative humidities in percent, obtained by radiosondes during October 1942*—Continued

Altitude (meters) m. s. l.	Stations and elevations in meters above sea level																							
	International Falls, Minn. (343 m.)				Joliet, Ill. (178 m.)				Lake Charles, La. (5 m.)				(1) Lakehurst, N. J. (39 m.)				Medford, Oreg. (40 m.)				Miami, Fla. (4 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	31	972	6.3	76	29	994	8.7	82	31	1,016	18.9	86	31	1,013	12.4	80	31	970	13.7	67	31	1,014	22.3	87
500	31	953	8.0	71	29	957	10.9	70	31	959	19.5	68	31	958	11.9	59	31	959	15.1	62	31	958	21.9	79
1,000	31	897	5.9	66	29	900	8.0	68	31	905	16.6	66	31	904	9.9	53	31	904	14.2	57	31	905	18.8	81
1,500	31	844	3.3	65	28	847	5.3	68	31	854	13.9	63	31	851	7.5	56	31	852	11.6	56	31	854	15.8	79
2,000	31	793	0.6	62	28	797	2.8	68	31	804	11.6	56	31	801	5.8	52	31	802	8.6	55	31	804	13.5	68
2,500	31	744	−1.9	59	28	749	−0.7	65	31	757	9.6	49	31	753	3.5	50	31	754	5.9	52	31	758	11.0	60
3,000	31	699	−4.5	58	28	704	−1.9	63	31	713	7.2	45	31	708	1.4	48	31	710	3.2	53	31	714	8.9	54
4,000	31	615	−10.1	55	28	620	−7.3	59	29	631	1.5	43	29	625	−3.7	49	30	627	−2.1	47	31	632	4.2	42
5,000	31	540	−16.4	53	28	545	−13.2	58	29	557	−4.2	40	29	550	−8.6	46	30	552	−7.9	43	31	558	−1.0	27
6,000	31	472	−23.3	51	28	477	−19.7	55	29	490	−10.9	38	28	482	−15.2	46	29	485	−14.2	42	28	492	−7.3	23
7,000	31	410	−30.3	49	27	416	−26.7	53	28	430	−18.2	28	26	422	−22.2	51	29	424	−21.7	42	27	432	−14.3	22
8,000	30	356	−37.1	48	25	362	−33.5	51	28	375	−25.5	36	22	366	−29.2	45	29	369	−28.9	40	25	378	−21.6	21
9,000	30	307	−43.0	----	25	313	−40.5	----	28	326	−33.0	35	21	318	−36.5	----	29	320	−36.0	38	24	329	−29.0	20
10,000	29	264	−48.2	----	25	270	−46.2	----	28	282	−40.8	----	19	276	−44.1	----	29	277	−42.8	----	22	286	−36.5	20
11,000	27	227	−52.3	----	25	232	−50.9	----	28	243	−48.3	----	17	237	−51.5	----	29	238	−49.5	----	18	246	−44.0	----
12,000	24	194	−55.4	----	24	199	−54.2	----	27	208	−55.0	----	16	203	−56.2	----	28	204	−54.9	----	12	212	−51.3	----
13,000	22	166	−56.2	----	21	170	−56.8	----	27	178	−60.6	----	14	173	−59.3	----	28	174	−58.4	----	11	182	−58.2	----
14,000	17	141	−56.9	----	18	145	−59.2	----	25	151	−65.0	----	13	146	−62.0	----	28	148	−60.6	----	9	155	−64.1	----
15,000	14	120	−58.3	----	14	123	−61.8	----	23	128	−68.9	----	12	123	−63.8	----	28	126	−63.0	----	6	131	−68.6	----
16,000	8	102	−58.8	----	9	104	−63.6	----	23	108	−71.4	----	9	104	−64.8	----	28	108	−64.6	----	6	111	−70.3	----
17,000	5	86	−58.9	----	8	88	−63.9	----	23	92	−71.5	----	5	88	−65.8	----	27	91	−64.8	----				
18,000					5	74	−62.5	----	21	77	−69.6	----					26	78	−63.7	----				
19,000									14	66	−66.9	----					20	66	−61.6	----				
20,000									5	55	−64.2	----					8	56	−59.3	----				

Altitude (meters) m. s. l.	Stations and elevations in meters above sea level																							
	Nashville, Tenn. (180 m.)				(1) Norfolk, Va. (4 m.)				Oakland, Calif. (6 m.)				Oklahoma City, Okla. (391 m.)				Omaha, Nebr. (301 m.)				(1) Pensacola, Fla. (24 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	31	996	14.4	75	25	1,018	16.5	83	31	1,016	15.2	80	31	970	14.3	79	30	980	10.8	70	23	1,015	21.9	71
500	31	959	16.3	62	25	961	17.3	66	31	959	17.6	60	31	958	15.6	73	30	957	12.8	59	23	960	20.1	57
1,000	31	904	13.2	60	25	906	15.1	62	31	904	16.5	50	31	904	15.0	63	30	902	11.4	56	23	906	16.9	54
1,500	31	852	10.2	63	25	854	12.1	62	31	853	14.7	42	31	852	12.3	62	30	849	8.9	58	23	855	14.2	49
2,000	31	802	7.8	64	24	804	9.4	60	31	803	12.4	38	31	802	10.0	61	30	799	6.2	59	23	805	12.3	35
2,500	31	754	5.4	62	24	756	7.0	54	31	756	9.5	36	31	755	7.6	57	30	752	3.8	54	23	758	9.6	33
3,000	31	710	3.2	59	24	712	4.8	51	31	712	6.4	36	31	710	5.1	52	30	706	1.3	50	23	713	6.9	32
4,000	31	632	4.2	42	21	629	−0.4	46	31	630	1.0	33	31	628	0.0	47	30	623	−4.4	45	23	631	1.4	34
5,000	31	558	−1.0	27	17	554	−6.8	37	30	555	−5.4	32	31	553	−6.1	44	30	548	−10.9	43	22	557	−4.3	38
6,000	31	492	−7.3	23	13	486	−12.8	31	29	488	−12.7	31	31	486	−12.9	41	29	481	−18.0	42	21	489	−11.0	39
7,000	28	484	−14.7	43	10	425	−20.2	29	28	427	−20.2	31	31	426	−20.1	39	29	420	−25.5	43	19	430	−17.7	39
8,000	28	424	−21.7	42					27	372	−28.1	31	31	371	−27.5	37	29	364	−32.6	43	9	375	−25.6	----
9,000	25	369	−28.8	41					26	323	−35.9	31	31	322	−35.0	35	29	316	−39.2	43	9	325	−32.8	----
10,000	25	320	−36.1	40					23	279	−43.9	----	31	279	−42.4	----	29	272	−44.7	----	8	282	−40.3	----
11,000	22	277	−43.5	----					20	240	−50.8	----	31	240	−49.5	----	28	234	−49.6	----	6	243	−46.8	----
12,000	21	238	−50.4	----					19	206	−56.0	----	31	206	−55.3	----	28	201	−53.9	----	5	209	−53.3	----
13,000	19	203	−56.2	----					17	175	−59.8	----	30	175	−59.0	----	27	172	−56.3	----				
14,000	16	174	−60.5	----					17	149	−62.5	----	28	149	−61.5	----	27	147	−58.0	----				
15,000	16	147	−64.2	----					16	127	−65.5	----	28	127	−64.4	----	27	125	−59.3	----				
16,000	15	124	−67.6	----					14	107	−67.3	----	26	108	−66.5	----	25	106	−60.8	----				
17,000	14	105	−70.4	----					13	91	−66.8	----	26	91	−66.8	----	22	90	−60.9	----				
18,000	14	75	−68.1	----					11	77	−65.2	----	24	77	−65.6	----	19	77	−60.1	----				
19,000	12	63	−65.5	----					6	65	−63.0	----	13	66	−62.9	----	14	65	−58.4	----				
20,000	8	53	−63.3	----					5	56	−59.8	----												

Altitude (meters) m. s. l.	Stations and elevations in meters above sea level							
	Phoenix, Ariz. (339 m.)				Portland, Maine (20 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	31	973	19.7	48	29	1,016	6.7	89
500	31	955	23.8	38	29	958	8.8	69
1,000	31	902	21.8	33	29	902	7.0	68
1,500	31	851	17.9	33	29	849	4.4	67
2,000	31	802	13.5	36	29	798	2.5	64
2,500	31	755	9.5	41	29	750	1.1	54
3,000	31	711	5.7	46	29	704	−1.1	47
4,000	31	628	−1.3	51	29	621	−6.5	45
5,000	31	554	−7.6	48	29	546	−12.4	44
6,000	31	486	−14.2	44	28	478	−18.9	41
7,000	31	425	−21.1	40	24	417	−26.0	40
8,000	30	371	−28.6	39	18	362	−33.4	40
9,000	30	321	−36.1	39	12	313	−40.9	----
10,000	30	278	−43.1	----	9	271	−46.6	----
11,000	30	239	−48.5	----	8	232	−53.5	----
12,000	30	205	−52.5	----	6	197	−59.0	----
13,000	30	175	−56.5	----				
14,000	30	150	−60.0	----				
15,000	30	127	−63.6	----				
16,000	29	108	−66.4	----				
17,000	28	92	−67.5	----				
18,000	27	78	−66.6	----				
19,000	19	66	−64.3	----				
20,000	12	56	−61.4	----				

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees Centigrade, and relative humidities in percent, obtained by radiosondes during October 1942*—Continued

Stations and elevations in meters above sea level

Altitude (meters) M. S. L.	St. Louis, Mo. (171 m.)				St. Paul, Minn. (225 m.)				San Antonio, Tex. (242 m.)				(1) San Diego, Calif. (19 m.)				S. S. Marie, Mich. (221 m.)				(1) Seattle, Wash. (27 m.)				Spokane, Wash. (598 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	31	996	12.9	69	31	987	8.4	74	31	988	18.9	83	31	1011	17.8	77	31	987	6.4	87	27	1,016	12.7	80	30	948	9.4	70
500	31	958	14.7	61	31	955	9.6	67	31	959	20.3	73	31	956	16.9	62	31	954	6.9	78	27	961	11.7	69				
1,000	31	903	11.7	60	31	899	7.1	62	31	905	17.8	69	31	902	17.4	41	31	898	6.0	69	27	905	9.6	65	30	903	11.6	57
1,500	31	850	8.7	62	31	846	4.3	63	31	854	15.5	71	31	851	15.1	28	31	845	3.8	67	27	852	6.9	58	30	850	8.5	56
2,000	31	800	6.4	62	31	795	2.2	59	31	804	13.4	62	31	802	12.3	25	31	794	1.8	63	27	801	4.0	55	30	800	5.2	54
2,500	31	753	3.9	61	31	747	0.4	55	31	758	11.2	55	31	755	8.9	26	31	746	−0.8	61	27	753	1.5	48	30	752	1.9	57
3,000	31	708	1.3	60	31	702	−2.1	54	31	714	8.7	50	31	711	5.7	24	31	700	−3.6	56	27	707	−0.9	42	30	706	−0.8	57
4,000	30	624	−3.7	57	31	618	−7.8	52	31	632	3.1	46	29	628	−0.9	29	31	616	−9.2	47	27	623	−6.5	46	30	623	−6.0	54
5,000	29	549	−9.8	52	31	543	−14.4	51	31	558	−2.7	40	29	553	−7.1	29	29	541	−15.6	44	27	548	−12.3	44	30	547	−11.9	49
6,000	28	482	−15.9	51	30	475	−21.4	49	31	491	−9.5	36	26	485	−14.1	----	29	472	−22.5	43	24	480	−18.8	50	30	480	−17.8	46
7,000	28	422	−22.9	48	29	414	−28.5	49	31	431	−16.5	36	24	425	−21.6	----	26	411	−29.1	42	22	419	−25.9	49	30	419	−24.7	44
8,000	28	367	−30.3	46	29	359	−35.4	49	31	376	−23.9	36	9	369	−29.5	----	22	357	−35.8	42	17	364	−32.7	49	30	364	−31.8	43
9,000	28	318	−37.4	44	28	310	−41.4	----	30	327	−31.4	35	9	320	−36.9	----	20	308	−41.4	----	15	315	−40.0	----	30	315	−39.1	42
10,000	28	274	−44.0	----	27	268	−45.2	----	29	284	−39.0	35	8	277	−43.6	----	17	266	−46.0	----	12	271	−47.0	----	29	272	−46.0	----
11,000	28	236	−49.7	----	26	231	−49.6	----	27	244	−46.6	----	7	238	−49.4	----	14	229	−49.8	----	9	233	−53.1	----	29	234	−51.8	----
12,000	27	203	−54.0	----	24	197	−53.4	----	25	210	−53.6	----	6	204	−55.3	----	9	196	−52.8	----	5	199	−58.1	----	28	200	−55.2	----
13,000	25	173	−56.8	----	21	168	−55.1	----	22	179	−59.9	----	----	----	----	----	8	169	−54.8	----	----	----	----	----	28	171	−57.1	----
14,000	24	148	−59.3	----	16	144	−56.5	----	22	152	−65.1	----	----	----	----	----	7	146	−56.3	----	----	----	----	----	24	146	−57.8	----
15,000	23	126	−61.9	----	14	122	−57.6	----	21	129	−69.4	----	----	----	----	----	6	125	−57.6	----	----	----	----	----	23	124	−59.1	----
16,000	22	107	−63.8	----	11	104	−58.3	----	18	109	−72.6	----	----	----	----	----	----	----	----	----	----	----	----	----	23	106	−59.4	----
17,000	21	91	−63.9	----	7	88	−57.7	----	15	91	−73.6	----	----	----	----	----	----	----	----	----	----	----	----	----	21	90	−58.7	----
18,000	19	78	−63.6	----	5	74	−55.6	----	11	77	−71.7	----	----	----	----	----	----	----	----	----	----	----	----	----	15	77	−57.9	----
19,000	10	66	−62.5	----	----	----	----	----	10	65	−68.8	----	----	----	----	----	----	----	----	----	----	----	----	----	8	65	−57.1	----
20,000	----	----	----	----	----	----	----	----	5	54	−64.8	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

Stations and elevations in meters above sea level

Altitude (meters) M. S. L.	Washington, D. C. (25 m.)				Anchorage, Alaska (42 m.)				Bethel, Alaska (7 m.)				Fairbanks, Alaska (156 m.)				Juneau, Alaska (49 m.)				Ketchikan, Alaska (26 m.)				McGrath, Alaska (100 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	30	1,015	15.0	81	31	995	4.1	78	24	1,003	0.7	77	31	984	−0.2	81	31	1,001	7.2	85	30	1,008	8.6	84	28	990	−1.5	83
500	30	960	14.6	69	31	940	2.0	77	24	943	−2.3	76	31	943	−1.7	82	31	948	4.9	83	30	952	5.9	86	28	942	−3.4	85
1,000	30	905	12.1	69	31	884	−0.6	76	24	886	−4.4	73	31	885	−3.1	82	31	892	1.5	87	29	896	2.8	86	28	884	−5.4	85
1,500	30	852	9.5	71	31	830	−3.8	79	24	831	−6.6	72	31	830	−4.7	79	30	837	−1.5	91	28	842	−0.1	84	28	829	−6.8	82
2,000	30	802	7.3	69	31	778	−7.2	83	24	779	−9.6	69	31	779	−7.1	77	26	786	−4.5	93	27	790	−2.5	80	28	777	−8.8	80
2,500	30	754	4.8	66	31	730	−10.4	84	24	730	−12.4	67	31	730	−9.8	76	23	737	−7.2	96	24	742	−4.9	74	28	728	−11.4	79
3,000	30	709	2.9	58	31	684	−13.5	83	24	683	−15.5	65	31	684	−12.9	75	22	691	−10.4	91	24	696	−7.6	72	28	682	−14.5	77
4,000	29	626	−2.2	54	31	599	−19.7	79	24	597	−21.8	62	31	600	−19.3	77	18	605	−16.7	82	24	610	−13.5	67	28	597	−20.6	71
5,000	29	552	−8.2	49	31	522	−26.1	75	23	521	−28.3	60	31	524	−26.0	74	14	529	−23.6	84	22	535	−19.4	69	28	521	−27.1	66
6,000	28	484	−14.3	45	27	454	−33.1	73	23	453	−34.8	58	31	455	−33.3	71	14	460	−30.1	79	20	466	−26.0	67	26	452	−33.7	65
7,000	27	424	−21.2	42	25	393	−40.5	----	21	391	−41.5	----	31	394	−40.6	----	12	399	−37.2	----	19	405	−32.2	67	25	391	−40.9	----
8,000	25	369	−28.5	39	24	338	−46.6	----	20	337	−47.9	----	30	339	−47.1	----	9	344	−43.5	----	18	350	−38.2	67	24	337	−47.6	----
9,000	25	320	−35.8	36	22	291	−50.4	----	20	288	−52.7	----	30	291	−51.8	----	8	296	−46.5	----	17	302	−43.4	----	24	289	−52.0	----
10,000	23	277	−43.1	----	20	249	−50.6	----	20	247	−53.8	----	30	249	−52.7	----	6	255	−44.4	----	14	260	−45.8	----	24	248	−52.4	----
11,000	22	238	−50.4	----	20	214	−49.4	----	20	212	−51.7	----	30	214	−50.7	----	5	220	−44.2	----	13	224	−47.2	----	23	213	−50.4	----
12,000	20	203	−56.1	----	19	184	−49.5	----	20	182	−50.7	----	30	183	−49.6	----	----	----	----	----	10	192	−48.3	----	21	182	−49.3	----
13,000	20	174	−59.4	----	19	157	−49.8	----	19	155	−50.7	----	29	157	−49.8	----	----	----	----	----	7	165	−48.1	----	19	157	−49.4	----
14,000	18	148	−62.7	----	18	135	−50.1	----	15	133	−51.1	----	28	135	−50.1	----	----	----	----	----	6	141	−48.9	----	17	135	−49.5	----
15,000	17	125	−64.9	----	17	116	−50.5	----	13	114	−51.4	----	24	116	−50.5	----	----	----	----	----	5	120	−49.4	----	9	116	−49.7	----
16,000	16	106	−65.5	----	17	99	−51.1	----	12	98	−51.8	----	13	99	−50.8	----	----	----	----	----	----	----	----	----	----	----	----	----
17,000	13	90	−65.3	----	15	85	−51.8	----	9	84	−51.8	----	9	85	−50.8	----	----	----	----	----	----	----	----	----	----	----	----	----
18,000	10	76	−63.6	----	12	73	−51.7	----	6	71	−52.0	----	5	73	−51.2	----	----	----	----	----	----	----	----	----	----	----	----	----
19,000	6	64	−61.2	----	6	63	−51.7	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees Centigrade, and relative humidities in percent, obtained by radiosondes during October 1942*—Continued

Altitude (meters) M. S. L.	Stations and elevations in meters above sea level								Altitude (meters) M. S. L.	Stations and elevations in meters above sea level							
	Nome, Alaska (..... M.)				San Juan, P. R. (15 M.)					Nome, Alaska (..... M.)				San Juan, P. R. (15 M.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity		Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	Insufficient obs.				31	1011	25.4	88	10,000					29	287	−34.3	44
500					31	957	23.4	90	11,000					28	248	−41.9	
1,000					31	904	20.5	87	12,000					28	214	−49.8	
1,500					31	853	17.7	82	13,000					28	183	−57.6	
2,000					31	804	15.2	76	14,000					28	156	−65.2	
2,500					31	758	12.8	69	15,000					26	132	−72.2	
3,000					31	714	10.2	63	16,000					22	111	−77.1	
4,000					31	633	4.3	62	17,000					20	93	−79.3	
5,000					31	559	−1.2	60	18,000					29	78	−77.1	
6,000					31	493	−7.2	57	19,000					18	66	−72.9	
7,000					31	433	−13.3	52	20,000					17	55	−68.1	
8,000					30	379	−19.9	50	21,000					12	47	−64.5	
9,000					29	330	−26.9	47	22,000					8	40	−61.7	

All observations taken at 11 p. m., 75th meridian time.
None of the means included in this table are based on less than 15 surface or 5 standard level observations.

Number of observations refers to pressure only, as temperature and humidity are missing for some observations at certain levels, also, the humidity data are not used in daily observations when the temperature is below −40° C.
Stations marked with the figure one (1) are Navy stations.

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TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees Centigrade, and relative humidities in percent, obtained by radiosondes during September, 1942*—Continued

Altitude (meters) m. s. l.	Stations and elevations in meters above sea level				Altitude (meters) m. s. l.	Stations and elevations in meters above sea level			
	McGrath, Alaska (100 m.)					McGrath, Alaska (100 m.)			
	Number of observations	Pressure	Temperature	Relative humidity		Number of observations	Pressure	Temperature	Relative humidity
Surface	20	995	12.6	74	8,000	19	355	−36.1	68
500	20	948	10.5	73	9,000	19	307	−43.0	
1,000	20	893	7.4	76	10,000	19	264	−47.7	
1,500	20	840	4.5	77	11,000	19	228	−49.1	
2,000	20	789	1.4	79	12,000	19	195	−49.4	
2,500	20	742	−1.6	81	13,000	19	168	−50.1	
3,000	20	697	−4.6	84	14,000	16	144	−50.9	
4,000	20	613	−10.2	80	15,000	16	123	−51.4	
5,000	20	538	−16.1	76	16,000	15	106	−51.3	
6,000	19	470	−22.1	71	17,000	11	90	−50.8	
7,000	19	409	−28.8	69	18,000	7	77	−50.4	

TABLE 2.—*Free-air resultant winds based on pilot-balloon observations made near 5 p. m. (75th meridian time) during October 1942. Directions given in degrees from North (N=360°, E=90°, S=180°, W=270°)—Velocities in meters per second*

Altitude (meters) m. s. l.	Abilene, Tex. (538 m.)			Albuquerque, N. Mex. (1,630 m.)			Atlanta, Ga. (299 m.)			Billings, Mont. (1,095 m.)			Bismarck, N. Dak. (512 m.)			Boise, Idaho (870 m.)			Brownsville, Tex. (7 m.)			Buffalo, N. Y. (220 m.)			Burlington, Vt. (132 m.)			Charleston, S. C. (17 m.)			Joliet, Ill. (178 m.)			Cincinnati, Ohio (152 m.)			Denver, Colo. (1,627 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	31	177	1.2	31	228	1.4	30	311	1.1	30	275	3.4	30	273	2.7	30	320	3.5	31	125	4.0	30	238	1.9	30	210	1.6	30	106	1.0	27	267	2.7	31	240	1.3	31	54	2.3
500							30	317	1.1										31	129	4.8	30	228	4.0	30	213	3.9	30	86	0.4	27	273	3.5	31	243	2.6			
1,000	31	172	2.6				30	291	1.5				30	279	3.5	30	315	3.6	27	159	3.4	27	232	6.5	30	235	4.3	29	322	2.2	25	260	4.5	29	253	3.7			
1,500	31	200	2.2				29	275	2.9	30	281	6.7	28	276	4.9	30	295	3.0	23	224	1.3	24	242	7.0	30	242	5.9	28	310	3.2	24	280	4.9	27	265	5.5			
2,000	30	233	4.8	31	243	1.6	29	284	5.2	29	285	8.0	27	287	6.9	30	291	3.2	21	278	1.6	19	253	7.2	26	243	7.6	24	300	3.9	21	273	5.8	23	260	7.0	31	44	2.1
2,500	28	259	6.5	31	268	2.6	28	291	6.1	29	282	7.9	24	291	7.4	29	291	3.9	20	300	1.9	16	284	8.4	19	272	8.1	24	286	4.0	15	281	7.2	20	263	8.1	29	20	1.3
3,000	28	268	7.2	31	281	3.6	25	289	6.9	28	286	8.1	23	282	7.7	28	296	4.8	18	273	2.7	15	293	8.8	13	288	5.9	24	272	4.9	13	293	7.5	20	263	9.6	27	312	2.2
4,000	27	263	9.4	26	292	5.5	21	292	6.3	23	288	8.0	19	276	10.1	26	302	6.1	16	276	4.7	13	291	11.8	10	288	7.8	23	265	6.6	10	301	10.0	16	272	11.1	24	283	5.8
5,000	25	263	11.0	21	298	4.9	20	280	9.4	19	286	10.3	17	271	9.9	25	310	8.3	15	276	4.6	10	290	8.0				19	264	7.3				11	289	9.2	21	289	8.9
6,000	25	265	13.6	18	280	5.5	18	279	11.8	16	293	9.3	16	271	10.5	22	304	10.7	14	273	5.3							16	276	8.9							19	293	8.9
8,000	20	271	17.0	13	285	5.2	12	280	11.6	14	281	9.8	13	294	10.1	18	318	10.3										11	281	9.6							14	290	5.7
10,000	18	267	22.9	13	270	8.3	12	286	14.7				13	297	13.7	15	307	11.0										10	288	12.0							12	275	5.7
12,000	13	272	24.3										10	319	13.8																								

TABLE 2.—*Free-air resultant winds based on pilot-balloon observations made near 5 p. m. (75th meridian time) during October 1942. Directions given in degrees from North (N=360°, E=90°, S=180°, W=270°)—Velocities in meters per second*—Continued

Altitude meters m. s. l.	El Paso, Tex. (1,196 m.)			Ely, Nev. (1,910 m.)			Grand Junction, Colo. (1,413 m.)			Greensboro N. C. (271 m.)			Havre, Mont. (767 m.)			Jacksonville, Fla. (16 m.)			Las Vegas, Nev. (573 m.)			Little Rock, Ark. (88 m.)			Medford, Oreg. (410 m.)			Miami, Fla. (15 m.)			St. Paul, Minn. (225 m.)			Mobile, Ala. (66 m.)			Nashville, Tenn. (194 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	31	261	1.7	30	325	2.2	30	321	2.1	30	254	0.4	29	267	3.8	31	49	3.3	31	120	1.1	31	353	0.4	30	316	0.7	31	61	2.6	31	277	2.2	29	30	0.3	31	297	1.4
500	---	---	---	---	---	---	---	---	---	30	282	1.1	---	---	---	31	39	2.8	---	---	---	31	255	0.3	30	317	0.9	31	47	4.8	31	274	2.5	29	61	0.4	31	276	1.8
1,000	---	---	---	---	---	---	---	---	---	27	248	2.8	29	268	5.3	31	6	2.1	31	113	1.2	30	233	1.3	29	6	0.3	31	27	4.3	30	260	4.0	27	14	1.0	31	253	2.6
1,500	31	255	1.7	---	---	---	---	---	---	26	270	3.8	29	269	5.8	30	340	2.3	31	147	0.5	30	248	2.3	27	220	1.5	31	7	4.1	29	268	5.2	27	330	1.7	31	258	4.7
2,000	31	257	1.8	30	329	2.1	30	295	4.0	23	298	5.4	29	279	7.2	28	325	2.3	31	276	1.6	27	266	4.3	27	241	2.0	26	352	2.8	26	277	5.9	27	309	2.4	26	278	4.9
2,500	29	264	3.0	30	317	1.9	30	289	3.0	22	303	6.9	25	278	7.9	28	317	2.4	31	302	1.7	26	266	5.4	25	257	0.6	22	331	1.9	22	286	6.0	25	325	2.3	24	283	5.4
3,000	29	264	3.3	29	284	1.5	29	266	3.5	21	305	7.1	22	284	8.6	27	303	1.9	29	309	1.4	21	281	6.4	24	278	2.3	20	283	2.5	22	291	6.1	25	316	2.3	23	288	6.9
4,000	27	270	6.5	27	306	3.4	22	286	3.9	21	284	9.1	18	283	8.6	26	280	3.6	28	341	2.6	18	288	7.9	24	302	5.8	14	263	2.8	17	306	7.0	21	299	4.2	19	284	9.8
5,000	25	265	9.4	23	306	5.6	18	300	4.2	19	280	10.9	13	279	10.8	22	282	6.6	27	346	2.8	17	301	10.5	23	298	7.5	13	265	4.9	15	322	7.4	19	290	7.2	18	283	11.0
6,000	25	259	10.8	22	317	5.2	14	319	4.6	19	277	12.3	---	---	---	19	274	8.8	26	337	4.3	15	292	11.5	21	291	6.2	12	267	7.9	15	328	8.5	18	288	9.3	15	294	10.7
8,000	23	264	15.7	17	320	8.2	---	---	---	14	285	11.4	---	---	---	11	270	11.1	22	2	8.4	---	---	---	20	303	8.4	---	---	---	12	347	6.8	13	283	13.9	---	---	---
10,000	14	260	19.0	12	342	8.8	---	---	---	13	278	14.6	---	---	---	---	---	---	21	353	7.8	---	---	---	14	298	11.1	---	---	---	---	---	---	10	287	13.9	---	---	---
12,000	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	17	338	5.8	---	---	---	13	288	13.0	---	---	---	---	---	---	---	---	---	---	---	---
14,000	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	15	284	7.5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Altitude (meters) m. s. l.	New York, N. Y. (15 m.)			Oakland, Calif. (8 m.)			Oklahoma City, Okla. (402 m.)			Omaha, Nebr. (306 m.)			Phoenix, Ariz. (338 m.)			Rapid City, S. Dak. (982 m.)			St. Louis, Mo. (181 m.)			San Antonio, Tex. (180 m.)			San Diego, Calif. (15 m.)			Sault Ste. Marie, Mich. (230 m.)			Seattle, Wash. (12 m.)			Spokane, Wash. (603 m.)			Washington, D. C. (24 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	29	60	0.5	31	277	3.7	29	173	2.0	31	273	0.8	31	240	1.0	30	336	4.8	31	268	1.8	30	126	1.1	30	271	3.8	25	251	1.7	30	222	1.7	31	281	0.8	26	155	1.4
500	29	158	0.6	31	307	2.5	29	167	2.2	31	290	0.6	31	249	1.7	---	---	---	31	270	2.7	30	140	1.8	30	277	3.1	25	241	2.7	30	207	2.9	---	---	---	26	182	1.8
1,000	27	257	2.0	29	332	1.6	28	173	1.9	31	254	2.1	31	252	2.1	30	333	4.7	29	257	3.3	27	148	2.0	26	307	1.0	25	244	4.7	27	213	4.1	31	238	3.6	24	232	2.9
1,500	23	268	5.9	28	343	2.7	27	228	3.1	31	254	3.5	31	228	1.6	30	316	4.8	29	271	4.9	25	170	1.8	24	26	0.8	22	276	6.3	25	221	4.9	31	237	4.0	23	271	3.8
2,000	20	287	6.9	26	345	3.5	26	272	3.5	27	260	4.5	31	228	1.6	28	302	5.3	27	281	7.0	25	238	3.2	24	70	1.3	21	287	8.1	20	218	4.5	29	245	6.0	22	271	6.3
2,500	19	292	6.9	26	347	3.6	26	272	4.9	26	278	6.2	31	227	1.7	28	298	7.3	26	278	7.4	23	252	4.9	24	43	2.2	21	291	10.2	18	232	5.1	26	252	6.7	22	279	8.1
3,000	12	313	8.3	26	333	3.7	24	272	6.0	24	293	6.0	31	205	1.9	27	298	8.3	26	281	8.8	21	255	6.6	24	37	2.5	15	308	9.2	12	273	4.6	23	264	7.2	18	290	8.4
4,000	---	---	---	25	337	3.9	22	284	8.1	22	291	5.3	29	175	1.1	20	291	9.4	23	283	11.6	16	265	8.3	19	357	3.7	---	---	---	10	298	7.1	17	274	8.8	18	279	10.5
5,000	---	---	---	21	359	8.2	21	289	8.5	20	305	6.6	27	200	2.3	19	289	10.0	20	290	13.2	15	277	7.5	15	331	6.8	---	---	---	---	---	---	16	284	9.9	16	273	11.4
6,000	---	---	---	21	350	9.9	19	287	11.8	20	304	6.8	26	221	1.8	19	291	10.7	14	298	9.1	15	284	10.0	11	344	8.2	---	---	---	---	---	---	16	283	12.1	12	274	16.1
8,000	---	---	---	15	347	7.9	14	301	11.2	15	301	10.5	22	275	4.5	15	295	10.6	11	310	13.2	14	276	15.6	---	---	---	---	---	---	---	---	---	10	312	11.4	---	---	---
10,000	---	---	---	14	17	3.6	10	296	15.2	10	308	7.5	18	267	9.1	13	290	10.6	---	---	---	11	277	19.7	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
12,000	---	---	---	---	---	---	10	289	19.8	---	---	---	10	288	10.9	11	287	7.7	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

TABLE 3.—*Maximum free-air wind velocities, (M.P.S.), for different sections of the United States based on pilot-balloon observations during October, 1942*

Section	Surface to 2,500 meters (m. s. l.)					Between 2,500 and 5,000 meters (m. s. l.)					Above 5,000 meters (m. s. l.)				
	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station
Northeast [1]	48.8	W	1,320	27	Kylertown, Pa.	41.4	WNW	4,060	7	Boston, Mass.	58.4	WSW	10,740	16	Portland, Maine.
East-Central [2]	33.8	SSW	1,360	29	Nashville, Tenn.	42.8	WNW	4,170	27	Huntington, W. Va.	61.3	W	12,800	19	Washington, D. C.
Southeast [3]	39.5	NNW	1,050	26	Spartanburg, S. C.	38.0	W	4,840	26	Atlanta, Ga.	50.2	WSW	12,480	19	Tampa, Fla.
North-Central [4]	43.3	SW	2,110	30	Detroit, Mich.	40.4	SW	2,500	30	Detroit, Mich.	49.6	NW	6,970	27	Milwaukee, Wis.
Central [5]	41.5	SSW	1,290	30	Evansville, Ind.	46.0	NW	5,000	25	North Platte, Nebr.	50.8	WNW	15,290	6	Wichita, Kans.
South-Central [6]	33.4	WSW	2,500	30	Dallas, Tex.	37.6	SW	3,130	30	Dallas, Tex.	66.4	WSW	11,690	30	Abilene, Tex.
Northwest [7]	42.2	W	2,470	31	Great Falls, Mont.	44.0	WSW	3,250	27	Pocatello, Idaho.	60.0	NNW	8,100 8,520	23	Spokane, Wash.
West-Central [8]	34.3	NW	2,370	21	Sheridan, Wyo.	56.4	NW	3,400	21	Cheyenne, Wyo.	64.0	NW	16,770	5	Denver, Colo.
Southwest [9]	40.4	NNW	2,500	13	Sandberg, Calif.	45.3	NNW	2,730	13	Sandberg, Calif.	50.0	W	10,750	27	Albuquerque, N. Mex.

[1] Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania and Northern Ohio.
[2] Delaware, Maryland, Virginia, West Virginia, Southern Ohio, Kentucky, Eastern Tennessee and North Carolina.
[3] South Carolina, Georgia, Florida and Alabama.
[4] Michigan, Wisconsin, Minnesota, North Dakota and South Dakota.
[5] Indiana, Illinois, Iowa, Nebraska, Kansas and Missouri.
[6] Mississippi, Arkansas, Louisiana, Oklahoma, Texas (except El Paso), and Western Tennessee.
[7] Montana, Idaho, Washington and Oregon.
[8] Wyoming, Colorado, Utah, Northern Nevada and Northern California.
[9] Southern California, Southern Nevada, Arizona, New Mexico, and extreme West Texas.

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RIVER STAGES AND FLOODS

By Bennett Swenson

Record breaking floods occurred during October in parts of the Potomac and Rappahannock River Basins from an extended period of extraordinarily heavy rainfall. The flood was especially severe in the Shenandoah River where stages exceeded the high water of March 1936, the previous maximum flood of record, by several feet. In other parts of the Potomac Basin, the stages approached or exceeded the flood levels established in 1936.

In other parts of the country, floods were notably absent except in the James River Basin, eastern North Carolina, and parts of Texas. Stages were unusually high in some of the smaller northern tributaries of the James River; otherwise the floods were light to moderate.

Atlantic Slope drainage.—A flood of unusual magnitude developed in the Potomac and Rappahannock River Basins on October 14. Before the 19th, when the flood waters had subsided, higher stages than ever had been recorded occurred in the Shenandoah River and in parts of the Rappahannock River Basin. At other places in the Potomac Basin, the flood closely approached or exceeded the previous maximum stages of record, most of which were established in March 1936. A table showing, flood heights at selected points in the Potomac Basin and comparisons with previous high stages of record, is given below.

The flood was caused by an extended period of unusually heavy rainfall. Rains began on the 12th in the southern parts and rapidly spread over all parts of the basins, continuing at many points until the morning of the 17th. Excessive rains occurred on the 13th, 14th, and 15th, and the amounts were heaviest in the Shenandoah and Rappahannock Basins. Several stations in these basins reported totals of more than 12 inches; the largest official amounts measured were 18.9 inches at Big Meadows, Va., on the divide between the Shenandoah and Rappahannock, and 17.6 inches at Front Royal, Va., in the Shenandoah Basin. Unofficial measurements indicate that more than 25 inches of rain fell at a point 6 miles north of Front Royal, and approximately 20 inches at several other places in the middle Shenandoah and upper Rappahannock Basins.

The rainfall was induced by a persistent cyclonic circulation which was centered over southeastern Virginia from the 13th to 17th. The circulation was originally established by a dissipating tropical disturbance which carried a very deep current of moisture-laden air over the headwaters of the Potomac River. A stagnant anticyclonic circulation over the northeastern United States helped to intensify the pressure gradient over northern Virginia so that persistent easterly winds caused orographic rains on the windward slopes of the Appalachian Mountains. These rains combined with other convective showers, caused by lifting and convergence of the moist air brought in by the tropical disturbance, to produce a four-day period of record rainfall.

The unusually intense rains in the Shenandoah Basin produced rapidly rising stages in the streams. At Riverton, Va., the river reached flood stage (22 feet) about 10 a. m. of the 15th and by the next morning had reached a crest stage of 46 feet. The previous highest stage of record at that place was 37.5 feet in March 1936. By 3 p. m., the Shenandoah crested near its mouth at a stage 6 feet higher than the 1936 flood.

The rainfall totals decreased rapidly in amount from the Shenandoah Basin westward over the South Branch of the Potomac Basin, where the totals ranged from slightly over 2 inches in the headwaters to 6 inches in the lower portion. Northwestward from this point the totals increased again with another small center of heavy rainfall of more than 8 inches located over the North Branch of the Potomac Basin. In the extreme north portion of the Potomac Basin the precipitation was relatively light, averaging about 4 inches.

The South Branch of the Potomac River crested at Springfield, W. Va., on the morning of the 16th at a stage of 13 feet lower than the flood of March 1936 at that place. The crest at Cumberland, Md., 24.0 feet in the afternoon of the 15th, was only 5 feet below the 1936 crest. In the main Potomac, the crests were as follows: Hancock, Md., 36.6 feet; Harpers Ferry, W. Va., 33.8 feet; and Washington, D. C., 17.5 feet. The stages in the main Potomac were lower than the 1936 flood crests except at Washington where the gage at the foot of Wisconsin Avenue registered a stage 0.3 foot higher than the record stage established in March 1936.

Considerable damage resulted from the high waters, especially in the Shenandoah and Rappahannock Basins. As reports on the damage, precipitation, and other features of the flood are not complete at this time, a further report will be made in a later issue of the Review.

The storm that caused the flood in the Potomac Basin also produced high water in portions of the James River Basin. The greater portion of the rain in this area occurred in a limited area embracing the Tye, Rockfish, and Rivanna River Basins. Floods of high proportions resulted in these basins and moderately high flood stages occurred in the James River from the mouth of the Tye River, downstream. Most of the damage occurred in the tributary flooding, the total losses exceeding $200,000.

The height of the flood crest in the lower James River was the highest since the flood of August 1940. At Richmond, Va., a stage of 19.5 feet occurred on October 17th.

Light to moderate flooding occurred in the Roanoke, Tar, and Neuse Rivers in North Carolina from the 14th to 28th, from rains which continued from the 11th to 16th. Rocky Mount, N. C., reported a 24-hour precipitation amount of 6.6 inches and Goldsboro, N. C., 7.77 inches on the morning of the 12th. There was no damage of consequence except in the Neuse River Basin where a total loss of about $100,000 was suffered.

West Gulf of Mexico drainage.—Heavy rains over the upper Trinity River watershed on October 15th to 18th caused considerable flooding of the lowlands immediately below Dallas, Tex., but only slight overflows occurred elsewhere. The damage as the result of the flood was light.

Heavy rains during October 16–17 over the San Saba River Basin caused some flooding in that stream. A crest of 30.5 feet was reached at San Saba, Tex., on the 18th. A large run-off occurred in the middle and upper Colorado River during the period October 17–20, but flood stage was not reached in the Colorado itself.

Summary of flood stages in Potomac Basin for flood of October 1942

River and station	Miles above Washington	Years of record	Maximum flood of record: Date	Time [2]	Stage (feet)	Maximum during flood of October 1942: Stage (feet)	Date	Time [1]
North Branch of Potomac, Cumberland, Md.	196	41	Mar. 17, 1936	11:30 p. m.	29.1	24.0	15	4 p. m.
South Branch of Potomac, Springfield, W. Va.[3]	193	18	Mar. 18, 1936	5:30 a. m.	34.2	21.1	16	5:30 a. m.
North Fork of Shenandoah, Cootes Store, Va.	188	18	Mar. 17, 1936	8 p. m.	23.25	25.2	15	3 p. m.
South Fork of Shenandoah, Lynnwood, Va.	198	13	Mar. 18, 1936	4 a. m.	26.6	27.2	15	8:15 p. m.
Shenandoah, Riverton, Va.	118	35	do	10 a. m.	37.5	[4]46.0	16	4 a. m.[4]
Potomac:								
Hancock, Md.	127	18	do	6 p. m.	47.6	36.6	16	3 p. m.
Williamsport, Md.	98	11	do	10 p. m.	48.6	36.1	16	7 p. m.
Harpers Ferry, W. Va.	60	52	Mar. 19, 1936	5 a. m.	36.5	33.8	16	6 p. m.
Washington (near), D. C. (Leiter gage).	6	13	do	4:45 p. m.	28.1	26.9	17	5:45 a. m.
Washington, D. C. (Wisconsin Ave. gage).	0	76	do	7 p. m.	17.2	17.5	17	7 a. m.

[1] Eastern standard time.
[2] Gage heights from U. S. Geological Survey gage.
[3] From flood marks.
[4] Approximate.

FLOOD-STAGE REPORT FOR OCTOBER 1942

River and station	Flood stage	Above flood stages—dates: From—	To—	Crest: Stage	Date
ATLANTIC SLOPE DRAINAGE					
North Branch of Potomac: Cumberland, Md.	*Feet* 17	15	16	*Feet* 24.0	15
South Branch of Potomac: Springfield, W. Va.	15	15	16	18.9	16

FLOOD-STAGE REPORT FOR OCTOBER 1942—Continued

River and station	Flood stage	Above flood stages—dates: From—	To—	Crest: Stage	Date
ATLANTIC SLOPE DRAINAGE—continued					
North Fork of Shenandoah: Cootes Store, Va.				25.2	15
South Fork of Shenandoah: Lynnwood, Va.				27.2	16
Shenandoah: Riverton, Va.	22	15	17	[1]46.0	16
Potomac:					
Hancock, Md.	30	15	17	36.6	16
Williamsport, Md.	23	15	17	36.1	16
Harpers Ferry, W. Va.	18	15	18	33.8	16
Washington (near), D. C.	10	15	19	26.9	17
Washington, D. C.	7	16	18	17.5	17
James:					
Scottsville, Va.	20	15	16	23.0	16
Bremo Bluff, Va.	19	15	17	29.2	16
Columbia, Va.	10	14	19	35.2	16
State Farm, Va.	12	15	18	23.3	17
Richmond, Va.	8	16	18	19.5	17
Roanoke:					
Randolph, Va.	21	16	16	21.9	16
Weldon, N. C.	31	17	18	32.3	17
Williamston, N. C.	10	20	23	10.4	22
Tar: Rocky Mount, N. C.	8	12	12	8.1	12
		16	20	9.2	18
Neuse:					
Neuse, N. C.	14	16	19	15.8	18
Smithfield, N. C.	13	16	20	16.0	17-18
Goldsboro, N. C.	14	14	25	20.5	19
Kinston, N. C.	14	14	28	17.7	23
MISSISSIPPI SYSTEM					
Upper Mississippi Basin					
Mississippi:					
Hannibal, Mo.	13	4	6	13.3	5
Louisiana, Mo.	12	2	3	12.0	2-3
Arkansas Basin					
North Canadian: Canton, Okla.	6	21	23	7.7	21
WEST GULF OF MEXICO DRAINAGE					
East Fork of Trinity: Rockwall (near), Tex.	10	18	19	10.4	19
Trinity:					
Dallas, Tex.	28	17	20	34.6	18-19
Trinidad, Tex.	28	24	25	28.3	25

[1] From flood mark.

CLIMATOLOGICAL DATA

CONDENSED CLIMATOLOGICAL SUMMARY OF TEMPERATURE AND PRECIPITATION BY SECTIONS

[For description of tables and charts, see REVIEW January 1940, p. 32]

In the following table are given for the various sections of the climatological service of the Weather Bureau the monthly average temperature and total rainfall; the stations reporting the highest and lowest temperatures, with dates of occurrence; the stations reporting the greatest and least total precipitation; and other data as indicated by the several headings.

The mean temperature for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperatures and precipitation are based only on records from stations that have 10 or more years of observations. Of course, the number of such records is smaller than the total number of stations.

Section	Temperature								Precipitation					
			Monthly extremes								Greatest monthly		Least monthly	
	Section average	Departure from the normal	Station	Highest	Date	Station	Lowest	Date	Section average	Departure from the normal	Station	Amount	Station	Amount
	°F.	°F.		°F.			°F.		In.	In.		In.		In.
Alabama	66.0	+1.2	Robertsdale	91	18	2 stations	25	27	1.99	−1.03	Melvin	4.92	Newton	T
Arizona	61.5	−.1	2 stations	104	[1]1	Alpine	14	[1]10	.93	+.07	McNary	6.19	2 stations	T
Arkansas	62.8	.0	5 stations	90	10	4 stations	22	26	3.19	−.01	Rogers	9.97	Crossett	1.15
California	61.4	+1.0	El Centro	107	5	Boca	11	29	.60	−.63	Crescent City (near)	3.59	21 stations	.00
Colorado	47.6	+.7	Julesburg	92	[1]7	Aspen	−1	31	2.33	+1.14	Red Feather Lakes	6.20	Monte Vista	.03
Florida	73.1	.0	Davenport	96	2	Vernon	29	27	1.20	−2.95	Kendall	7.03	5 stations	.00
Georgia	65.0	.0	3 stations	92	[1]23	2 stations	25	27	2.08	−.59	La Grange	5.31	2 stations	.07
Idaho	48.3	+1.2	2 stations	92	[1]8	Blackfoot Dam	2	29	1.32	−.18	Deception Creek	7.89	Bliss	.21
Illinois	56.2	+.4	DuQuoin	89	8	Galva	15	26	1.91	−.77	Waterloo	4.27	Chester	.21
Indiana	56.0	+1.0	Tell City	90	14	2 stations	17	27	1.73	−1.08	Rochester	5.48	Scottsburg	.52
Iowa	53.1	+1.4	Ottumwa	90	8	Cresco	10	26	1.53	−.84	Grundy Center	3.70	Cherokee	.28
Kansas	57.8	+.5	2 stations	95	7	Burr Oak (near)	10	26	2.80	+.82	Pratt	6.15	Long Island	.45
Kentucky	58.7	+.3	Clermont	88	3	St. John	18	27	2.81	+.11	Pippapass	5.53	Louise	1.03
Louisiana	69.0	+.4	Camp Polk	93	2	Winnsboro	28	27	3.10	−.22	Houma	11.00	Camp Livingston	.29
Maryland-Delaware	57.9	+1.6	Great Falls, Md	89	9	Oakland, Md	14	28	6.60	+3.56	2 stations	9.85	Sines, Md	3.50
Michigan	49.3	+.5	Midland	85	4	3 stations	12	28	2.99	+.25	Jackson	5.84	Alpena	.79
Minnesota	47.4	+.9	3 stations	85	7	Meadowlands	−9	28	1.06	−.81	Pigeon River Bridge	6.42	Hallock	.07
Mississippi	66.6	+1.0	Kosciusko	92	3	3 stations	24	27	2.91	+.29	Port Gibson	6.71	Greenville	1.22
Missouri	58.0	+.3	2 stations	90	[1]2	Grant City	13	26	2.97	.00	Seligman	8.20	Kahoka	.62
Montana	46.6	+1.6	Garland	93	10	Adel (near)	−2	25	1.01	−.06	Heron	3.25	Telegraph Creek	.12
Nebraska	52.7	+1.0	Culbertson	95	7	Nenzel (near)	9	[1]25	.86	−.60	Haigler	3.10	2 stations	.00
Nevada	53.6	+3.0	Sulphur	103	19	Geyser	1	29	.43	−.19	Lamoille (near)	2.00	3 stations	.00
New England	50.8	+1.3	Weston, Mass	85	9	3 stations	18	[1]16	3.12	−.37	Plainfield, Mass	5.88	Orono, Maine	1.01
New Jersey	56.1	+1.5	2 stations	87	[1]8	Belleplain	21	28	3.43	−.18	Atlantic City	6.59	Sandy Hook	2.25
New Mexico	53.2	−.6	do	93	[1]1	Eagle Nest	10	31	1.72	+.55	Clovis	6.72	Bernardo	T
New York	52.0	+2.0	do	83	9	2 stations	20	27	3.32	+.03	Jeffersonville	5.65	Ogdensburg	1.14
North Carolina	61.0	+.9	Goldsboro	88	5	Mount Mitchell	9	27	4.61	+1.30	Hatteras	19.18	Lenoir	1.21
North Dakota	46.5	+2.5	Fort Yates	90	10	2 stations	−3	25	.46	−.55	Milnor	1.81	Kenmare	T
Ohio	55.3	+1.7	3 stations	86	[1]3	McArthur	17	27	2.03	−.52	Jefferson	5.44	Washington, C. H.	.88
Oklahoma	61.7	−.9	2 stations	92	[1]1	Jay	21	26	3.87	+.80	Watts	8.34	2 stations	1.59
Oregon	51.5	+1.8	3 stations	92	[1]1	Harney Branch	8	28	1.38	−.53	Timberline Lodge	10.72	Fremont	T
Pennsylvania	53.9	+1.3	Phoenixville	88	9	2 stations	15	[1]27	4.50	+1.27	Glencoe	8.85	Pottstown	1.93
South Carolina	64.8	+1.0	Ridgeland	91	24	do	27	27	1.72	−1.16	Chappells	5.48	Charleston	.01
South Dakota	49.7	+1.0	Kennebec	95	7	Pollock	−2	26	.76	−.41	Harveys Ranch	2.88	Geddes	.05
Tennessee	60.6	+.8	Moscow	89	[1]3	Rugby	19	27	3.04	+.19	Cedar Hill	5.17	Morgan Springs	1.31
Texas	66.9	−.8	2 stations	99	[1]1	Socorro	25	31	3.46	+.70	Eastland	10.28	Eagle Pass	.18
Utah	50.9	+1.8	St. George	94	5	Woodruff	−7	29	.94	−.21	Great Basin Expt. Sta.	2.15	Delta	.15
Virginia	58.7	+1.2	Chatham	88	10	Mountain Lake	17	27	6.34	+3.33	Riverton	17.82	Floyd	2.10
Washington	51.7	+1.6	Wahluke (near)	90	6	Chewelah	11	24	2.82	−.27	Higley Peak	16.13	White Swan	T
West Virginia	55.8	+1.1	3 stations	87	3	Thornwood	11	28	4.04	+1.18	Inwood	11.81	Hogsett (D. 26, O. R.)	1.02
Wisconsin	48.8	+.5	Wisconsin Dells	85	8	Long Lake	9	28	1.89	−.58	Wausau	3.72	Amery	.60
Wyoming	45.0	+1.3	Worland	88	10	Sage	−10	29	1.79	+.71	Hecla	4.86	Kemmerer	.27
Alaska (September)	49.0	+4.9	Skagway	82	2	Puntilla	12	16	4.62	+1.05	Latouche	20.29	Tanacross	.29
Hawaii	75.3	+1.2	Waianae	94	4	Volcano Observatory.	49	28	.90	+.38	Kukui	28.00	Hukipo	T
Puerto Rico	78.8	+.9	2 stations	96	2	Guineo Reservoir	57	26	8.75	+.75	Lares	20.41	Culebra Island	2.32

[1] Other dates also.

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to mean of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max.+mean min.÷2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean wet thermometer temperature of the dewpoint	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01 inch or more	Wind: Average hourly velocity	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month	Number of days with thunderstorms
	Ft.	*Ft.*	*Ft.*	*In.*	*In.*	*In.*	°*F.*	°*F.*	°*F.*		°*F.*	°*F.*		°*F.*	°*F.*	°*F.*	°*F.*	%	*In.*	*In.*		*Miles*							*0–10*	*In.*	*In.*	
New England							**51.7**	**+1.5**									**82**	**3.01**	**−0.3**										**5.2**			
Eastport	75	67	85	29.99	30.07	+0.07	49.2	+1.7	64	15	55	35	17	43	21	46	88	2.79	−.8	8	9.5	w.	29	s.	6	14	7	10	4.6	0.0	0.0	1
Greenville, Maine	1,070	6	41	28.89	30.07	.....	45.6	+.7	72	9	58	22	17	33	45	40	39	2.25	−1.4	11	.....	nw.	.....	.....	.....	9	11	11	.....	.0	.0	2
Portland, Maine [1]	103	5	36	29.95	30.06	+.02	49.2	.....	79	9	61	25	29	37	35	44	41	2.55	−.6	8	8.1	s.	24	s.	6	16	7	8	4.5	.0	.0	1
Concord [1]	289	4	45	29.76	30.08	+.03	50.0	+.3	79	9	64	20	29	36	41	43	41	2.23	−.6	10	5.9	se.	20	nw.	18	8	14	9	5.1	T	.0	1
Burlington [2]	403	11	48	29.59	30.04	.00	49.3	+.1	69	5	59	30	3	40	31	44	40	3.21	+.2	7	9.6	s.	34	s.	30	8	13	10	5.5	T	.0	1
Northfield	876	12	60	.....	30.08	+.04	47.8	+2.3	73	9	61	23	3	35	.....	.....	.....	3.29	+.4	7	7.2	s.	22	s.	30	11	10	10	.....	T	.0	1
Boston [1]	124	33	62	29.94	30.07	+.02	55.8	.....	82	9	64	36	28	48	27	49	45	2.78	−.4	10	10.2	sw.	33	ne.	18	8	13	10	5.6	.0	.0	2
Nantucket	12	10	63	30.06	30.08	+.03	55.8	+1.6	70	31	61	41	27	51	17	52	49	3.70	+.3	7	11.3	ne.	35	ne.	18	12	5	14	5.5	.0	.0	2
Block Island	26	11	46	30.05	30.08	+.03	56.0	+1.1	67	9	61	40	27	51	17	52	49	3.60	.0	9	15.0	e.	38	n.	18	14	9	8	4.4	.0	.0	3
Providence [2]	159	46	60	29.92	30.09	+.04	55.8	+3.6	83	9	65	33	29	47	30	49	46	3.09	.0	8	7.6	n.	23	ne.	18	9	10	12	5.8	.0	.0	1
Hartford [1]	159	5	44	29.90	30.07	+.01	54.2	.....	82	9	66	29	29	43	34	48	45	2.80	−.7	7	7.4	sw.	26	nw.	26	9	10	12	5.9	.0	.0	0
New Haven [1]	107	74	153	29.97	30.08	+.02	55.8	+2.0	79	9	65	35	28	47	26	50	47	3.89	+.2	8	8.3	n.	23	s.	26	10	12	9	5.1	.0	.0	0
Middle Atlantic States							**58.5**	**+2.1**									**79**	**4.94**	**+2.0**										**5.6**			
Albany [1]	97	26	40	29.95	30.06	.00	51.4	+2.1	74	15	62	28	29	41	38	45	41	2.85	+.4	9	8.1	s.	27	s.	30	7	14	10	5.7	T	.0	0
Binghamton	871	57	79	29.13	30.07	+.01	53.0	+3.0	74	8	63	31	27	43	37	47	43	3.06	+.1	12	5.3	e.	17	s.	6	7	9	15	6.5	.6	.0	1
New York	314	415	454	29.73	30.06	.00	58.8	+2.5	80	9	66	36	27	52	24	52	47	1.91	−1.6	9	12.1	ne.	39	nw.	26	13	7	11	5.1	.0	.0	0
Harrisburg [1]	374	30	49	29.66	30.06	−.02	57.0	+2.2	83	9	66	29	28	47	35	50	47	4.40	+1.5	9	7.1	se.	26	s.	21	9	8	14	6.2	.0	.0	0
Philadelphia [2]	114	174	367	29.95	30.07	.00	59.0	+1.2	82	9	66	36	27	52	26	52	49	3.40	+.6	9	11.7	ne.	29	ne.	12	10	8	13	5.2	.0	.0	0
Reading	323	47	306	29.72	30.08	.....	57.2	+1.7	82	9	66	32	28	48	32	.....	.....	3.22	+.1	10	9.6	e.	28	se.	26	11	7	13	5.7	.0	.0	0
Scranton	805	72	104	29.20	30.06	−.01	54.2	+2.3	74	8	64	32	27	45	35	.....	.....	4.66	+1.5	9	5.6	n.	19	n.	18	9	10	12	5.8	T	.0	0
Atlantic City	52	37	172	30.00	30.06	−.01	59.8	+2.9	76	9	65	36	28	54	20	55	53	6.59	+3.4	12	16.1	ne.	42	ne.	12	10	9	12	5.3	.0	.0	1
Trenton	190	89	107	29.86	30.06	.....	57.2	+1.6	83	9	66	35	28	49	32	51	48	3.51	+.7	10	8.0	s.	24	nw.	26	10	7	14	5.5	.0	.0	0
Baltimore [2]	123	100	215	29.92	30.06	−.02	60.7	+2.5	86	9	68	35	27	53	28	54	50	7.75	+4.9	11	10.0	ne.	31	sw.	27	13	5	13	5.4	.0	.0	2
Washington [1]	112	62	85	29.93	30.06	−.02	60.3	+2.9	81	9	69	31	28	52	30	54	51	8.18	+5.5	12	6.8	ne.	24	w.	6	14	5	12	5.1	.0	.0	3
Cape Henry	18	8	54	30.01	30.03	.....	63.2	+1.1	82	23	70	38	29	60	25	59	56	4.33	+1.3	9	12.4	ne.	46	ne.	11	12	6	13	5.5	.0	.0	1
Lynchburg	686	144	184	29.32	30.05	−.04	60.4	+1.9	85	9	70	31	28	50	40	53	50	7.02	+3.9	10	6.5	nw.	26	ne.	12	12	6	13	5.4	.0	.0	3
Norfolk [2]	91	80	125	29.94	30.04	−.03	64.6	+2.1	82	9	71	41	27	58	24	57	56	5.87	+2.8	10	9.3	ne.	32	e.	12	11	5	15	5.7	.0	.0	3
Richmond [2]	144	11	52	29.87	30.02	−.06	61.2	+1.6	81	9	70	32	28	52	33	56	54	7.38	+4.5	12	6.9	sw.	20	ne.	12	13	4	14	5.5	.0	.0	2
South Atlantic States							**65.8**	**+1.7**									**80**	**3.60**	**+0.3**										**4.4**			
Asheville	2,253	89	104	27.74	30.08	−.01	57.5	+2.2	78	2	68	29	27	47	36	50	48	1.72	−1.0	8	7.2	nw.	23	nw.	26	10	8	13	5.6	.0	.0	0
Charlotte [2]	779	63	86	29.22	30.05	−.03	63.4	+1.7	82	9	73	35	27	54	31	55	52	80	2.13	−.8	7	6.2	n.	22	sw.	22	12	10	9	4.6	.0	.0	1
Greensboro [1]	886	6	56	29.12	30.06	.....	60.0	.....	82	9	71	29	27	49	41	53	51	83	4.27	.....	9	7.8	ne.	28	ne.	12	13	6	12	5.3	.0	.0	0
Hatteras	11	5	50	30.00	30.00	−.06	67.4	+1.5	79	15	72	47	27	63	21	63	61	85	19.18	+14.2	14	11.6	ne.	33	ne.	11	11	9	11	5.5	.0	.0	5
Raleigh [1]	376	27	69	29.64	30.04	−.03	62.5	+1.7	82	9	73	34	27	52	34	56	54	84	6.26	+3.4	9	7.4	ne.	31	ne.	12	12	7	12	5.1	.6	.0	2
Wilmington	72	73	107	29.95	30.02	−.04	66.8	+1.5	80	9	76	41	27	58	25	60	57	79	5.17	+1.9	10	8.2	n.	25	nw.	11	17	5	9	4.0	.0	.0	2
Charleston [2]	48	11	92	29.97	30.02	−.04	69.4	+1.6	85	16	78	48	27	61	22	60	58	87	.01	−3.3	1	9.9	n.	22	e.	28	20	7	4	3.2	.0	.0	0
Columbia, S. C. [2]	347	70	91	29.66	30.03	−.04	66.1	+1.8	83	15	77	39	27	55	36	58	55	82	1.01	−1.6	6	7.4	n.	25	sw.	22	16	8	7	3.8	.0	.0	1
Greenville, S. C. [1]	1,040	70	78	28.94	30.04	.....	62.8	+2.6	81	17	73	35	27	53	34	55	51	73	2.37	−.8	11	8.3	ne.	24	n.	6	12	9	10	4.9	.0	.0	2
Augusta [2]	182	62	77	29.84	30.03	−.04	66.6	+1.3	86	2	79	37	27	55	35	58	52	67	.58	−1.9	5	5.1	nw.	25	sw.	28	15	7	9	4.1	.0	.0	1
Savannah [2]	65	73	152	29.95	30.02	−.03	70.3	+2.4	87	16	81	44	27	59	29	61	58	80	.46	−2.5	3	8.8	n.	26	ne.	28	19	10	2	3.0	.0	.0	3
Jacksonville [2]	43	86	110	29.97	30.01	−.01	71.2	+.1	86	18	80	44	27	62	25	64	61	83	.68	−3.8	4	6.9	ne.	19	ne.	9	18	10	3	3.6	.0	.0	1
Florida Peninsula							**77.7**	**+0.9**									**81**	**2.08**	**−3.8**										**3.3**			
Key West [2]	21	10	64	29.92	29.94	.00	79.8	+.7	87	3	85	70	31	75	15	73	70	78	.95	−5.0	9	8.4	ne.	21	ne.	2	25	5	1	2.5	.0	.0	1
Miami [2]	25	124	168	29.92	29.95	−.02	78.0	+1.0	86	7	84	65	28	72	19	70	68	86	5.27	−3.2	16	8.4	ne.	26	ne.	1	10	12	9	5.1	.0	.0	3
Tampa [1]	35	5	61	29.95	29.98	.00	75.4	+1.1	88	25	85	56	28	66	26	66	64	78	.03	−3.1	2	9.5	n.	25	ne.	8	23	8	0	2.3	.0	.0	0
East Gulf States							**67.8**	**+1.1**									**80**	**2.27**	**−0.6**										**4.0**			
Atlanta [1]	1,173	5	72	28.82	30.04	−.03	63.6	+.9	83	2	74	33	27	53	31	56	53	78	3.86	+1.2	9	8.1	nw.	32	nw.	26	13	9	9	4.4	.0	.0	4
Macon [2]	370	79	87	29.64	30.03	−.03	65.6	+1.1	85	20	78	35	27	54	34	57	54	75	.80	−1.4	7	6.1	n.	21	w.	5	16	7	8	4.0	.0	.0	1
Thomasville	273	49	58	29.75	30.05	+.01	68.8	+.6	86	20	82	37	27	56	42	.....	.....	.....	.49	−2.5	5	.....	.....	.....	.....	.....	15	12	4	.....	.0	.0	0
Apalachicola	35	11	51	29.97	30.00	.....	71.2	+.6	85	5	80	44	27	62	24	64	61	79	.40	−2.8	3	7.7	n.	29	se.	30	21	8	2	2.7	.0	.0	2
Pensacola	56	54	79	29.96	30.02	−.01	71.2	+1.3	86	17	80	39	27	62	29	64	60	75	1.71	−2.5	5	7.3	ne.	21	se.	30	22	6	3	3.0	.0	.0	1
Anniston	741	9	.....	.....	.....	.....	62.6	+.2	83	2	75	29	27	50	36	.....	.....	.....	2.80	+.2	6	.....	se.	.....	.....	.....	12	12	7	.....	.0	.0	2
Birmingham [2]	700	11	48	29.31	30.05	−.02	65.1	+.3	83	3	76	32	27	54	30	56	54	84	1.40	−1.0	9	6.2	n.	24	se.	30	16	5	10	4.1	.0	.0	2
Mobile [2]	57	6	30	29.97	30.03	−.01	70.1	+.8	86	3	80	40	27	60	29	62	59	81	3.18	−.4	7	5.9	n.	24	n.	26	8	17	6	4.7	.0	.0	3
Montgomery [2]	218	92	105	29.80	30.03	−.03	68.2	+1.6	86	2	78	38	27	58	28	58	56	81	1.77	−.7	8	6.3	n.	21	n.	26	16	7	8	3.9	.0	.0	1
Meridian [2]	375	67	92	29.64	30.04	−.02	66.0	+1.7	88	17	78	31	27	54	34	58	56	84	2.78	+.4	8	5.1	ne.	20	sw.	22	14	6	11	4.6	.0	.0	1
Vicksburg [2]	247	82	102	29.76	30.02	−.04	68.1	+1.4	87	18	78	40	27	58	28	55	54	86	3.73	+1.0	5	7.5	n.	24	s.	30	12	11	8	4.5	.0	.0	2
New Orleans [2]	53	76	84	29.96	30.01	−.02	73.6	+2.6	88	18	81	47	27	66	19	65	62	76	4.22	+.9	6	6.2	se.	18	n.	26	16	11	4	3.6	.0	.0	3
West Gulf States							**68.7**	**+1.1**									**76**	**3.98**	**+0.9**										**5.0**			
Shreveport [1]	249	92	227	29.75	30.01	−.04	66.8	+1.2	87	17	79	35	27	54	37	58	55	75	1.34	−1.4	4	7.4	se.	29	s.	29	14	5	12	4.7	.0	.0	1
Bentonville	1,303	12	51	28.68	30.05	.00	59.1	+1.1	81	9	71	25	26	48	35	.....	.....	.....	7.62	+4.0	7	5.5	s.	26	sw.	29	11	15	5	.....	.0	.0	2
Fort Smith	463	57	82	29.52	30.00	−.05	63.6	+.8	84	10	74	32	26	53	34	55	49	68	5.18	+2.2	9	5.6	e.	21	w.	30	14	5	12	5.0	.0	.0	3
Little Rock [1]	357	.....	.....	29.65	30.03	−.03	63.8	+.2	85	3	77	31	27	51	39	55	51	74	3.34	+.6	6	6.4	sw.	30	s.	29	15	8	8	4.5	.0	.0	1
Austin [2]	605	68	90	29.36	30.00	.....	68.3	.0	87	22	78	45	26	58	34	62	59	80	5.14	+2.0	10	7.5	n.	28	n.	25	10	10	11	5.4	.0	.0	5
Brownsville [2]	57	88	96	29.87	29.93	.....	77.4	+2.5	91	1	86	62	31	69	27	70	68	82	.61	−3.0	9	8.9	se.	27	s.	29	4	15	12	6.2	.0	.0	4
Corpus Christi [2]	20	11	78	29.94	29.97	−.03	75.8	+2.6	89	22	82	58	26	69	23	68	66	81	1.59	−.9	9	10.0	s.	28	s.	29	9	11	11	5.6	.0	.0	3
Dallas [1]	512	6	46	29.46	30.00	.....	65.2	.....	86	11	76	37	26	54	34	58	53	72	6.42	+3.7	6	8.3	se.	38	s.	29	11	7	13	5.5	.0	.0	4
Fort Worth [1]	679	35	56	29.30	30.01	−.02	65.4	−.3	86	12	76	37	26	55	30	58	54	74	6.18	+3.4	8	9.2	se.	50	w.	14	9	10	12	5.5	.0	.0	6
Galveston [2]	54	106	114	29.93	29.99	−.04	74.3	+1.6	84	11	79	60	26	70	17	68	66	81	2.82	−1.5	5	9.0	se.	27	sw.	22	18	8	5	3.5	.0	.0	1
Houston [2]	138	157	190	29.85	30.00	.....	72.3	+2.0	90	25	82	49	27	63	25	64	61	81	1.50	−2.2	6	9.2	se.	30	se.	29	10	15	6	4.8	.0	.0	4
Palestine	510	64	72	29.49	30.02	−.01	67.6	+.4	86	22	78	42	27	57	30	59	54	69	1.28	−2.0	7	6.2	n.	24	s.	30	17	8	6	4.0	.0	.0	1
Port Arthur	34	59	134	29.97	30.00	.....	72.6	.....	87	4	81	54	27	64	25	65	62	78	3.18	−.2	6	10.7	s.	36	sw.	22	16	8	7	4.2	.0	.0	3
San Antonio [1]	693	28	59	29.27	29.99	−.02	69.6	+.9	88	3	80	48	31	59	36	62	59	76	9.56	+7.3	9	6.8	n.	27	ne.	26	9	12	10	5.5	.0	.0	3
Ohio Valley and Tennessee							**59.1**	**+1.3**									**77**	**2.42**	**−0.2**										**5.4**			
Chattanooga [1]	762	21	54	29.24	30.06	−.03	60.4	+2.7	83	4	74	26	27	47	38	53	51	82	2.18	−.8	9	5.2	s.	23	n.	26	15	6	10	4.4	.0	.0	3
Knoxville [2]	995	66	84	29.01	30.06	−.03	60.0	+.1	83	3	72	29	27	48	39	52	49	78	3.12	+.5	8	6.1	ne.	27	sw.	22	11	13	7	4.8	.0	.0	3
Memphis [2]	399	78	86	29.60	30.02	−.05	63.2	−.1	87	3	76	33	27	50	37	54	50	75	3.54	+.9	6	6.9	e.	25	n.	25	19	8	4	3.2	.0	.0	2
Nashville [1]	546	5	72	29.46	30.04	−.04	61.4	.....	85	3	74	27	27	48	36	52	48	72	3.05	+.6	11	5.8	s.	29	s.	30	13	11	7	4.4	.0	.0	2
Lexington	989	6	.....	28.99	30.07	−.01	58.0	+.6	84	3	70	25	27	46	33	.....	.....	.....	3.54	+1.0	14	.....	.....	.....	.....	.....	11	9	11	5.4	T	.0	2
Louisville [2]	525	106	120	29.47	30.03	−.05	59.1	−.2	84	3	68	28	26	50	35	51	47	77	1.80	−.8	8	7.6	sw.	33	sw.	30	8	11	12	6.0	T	.0	1
Evansville [1]	431	5	38	29.57	30.03	−.05	57.4	+.4	84	9	70	24	26	45	39	49	44	70	1.45	−1.4	6	7.1	s.	33	s.	30	9	12	10	5.4	T	.0	1
Indianapolis [2]	823	98	129	29.14	30.02	−.05	57.2	+1.5	83	8	67	24	26	47	33	48	44	77	1.11	−1.7	7	7.4	s.	25	s.	30	11	7	13	5.5	.0	.0	0
Terre Haute [2]	575	68	149	29.41	30.03	.....	57.7	.....	84	8	68	24	26	47	32	48	44	76	1.88	−.8	8	8.8	sw.	31	se.	30	9	13	9	5.2	T	.0	1

See footnotes at end of table.

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS—Continued

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to means of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max.+mean min.÷2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean wet thermometer temperature of the dew point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01 inch or more	Wind: Average hourly velocity	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month	Number of days with thunderstorms
Ohio Valley and Tennessee—Con.	*Ft.*	*In.*	*Ft.*	*In.*	*In.*	*In.*	°*F.*	°*F.*	°*F.*		°*F.*	°*F.*		°*F.*	°*F.*	°*F.*	°*F.*	%	*In.*	*In.*		*Miles*							*0–10*	*In.*	*In.*	
Cincinnati [2]	627	11	51	29.37	30.04	−.04	57.3	+1.6	84	3	68	25	27	47	35	50	47	80	1.68	−.8	10	6.8	sw.	22	sw.	30	7	11	13	6.2	0.0	0.0	2
Columbus [2]	822	90	110	29.16	30.04	0.04	57.4	+2.2	82	3	67	25	27	48	33	49	45	77	1.06	−0.4	6	8.8	s.	37	s.	30	11	5	15	5.8	T	.0	1
Dayton [2]	900	186	213	29.07	30.03	.....	56.6	+1.6	81	3	66	25	27	48	34	48	44	78	1.86	−.7	9	9.5	sw.	38	s.	30	11	6	14	5.5	.0	.0	3
Elkins [2]	1,947	61	78	28.02	30.08	−.02	54.6	+2.3	80	3	66	21	28	43	40	46	44	85	3.45	+.5	15	5.2	se.	27	w.	5	7	5	19	6.9	T	.0	1
Parkersburg	637	77	84	29.36	30.05	−.03	58.4	+2.3	82	8	69	28	28	48	36	51	47	77	2.66	+.2	10	4.8	se.	20	nw.	26	10	8	13	5.4	T	.0	1
Pittsburgh [1]	842	39	54	29.14	30.04	−.04	55.6	+1.5	78	8	64	25	27	47	34	49	45	75	3.91	+1.4	11	9.9	s.	31	nw.	5	7	8	16	6.4	T	.0	1
Lower Lake Region							53.2	+1.7										78	2.83	0.0									6.0			
Buffalo [2]	768	243	280	29.19	30.02	−.03	53.2	+1.3	75	3	60	31	27	46	28	47	43	77	3.12	−.2	16	15.2	s.	47	sw.	22	10	4	17	6.3	T	.0	0
Canton	448	10	61	29.53	30.01	.....	50.0	+2.8	71	21	61	27	3	40	37	44	41	78	1.99	−1.0	11	8.2	sw.	26	sw.	8	8	7	16	6.3	5.4	.0	0
Ithaca	836	77	100	.....	.....	.....	53.2	+2.1	74	8	62	29	27	44	36	.....	.....	.....	2.90	−.1	12	8.1	nw.	25	se.	30	7	10	14	6.3	1.1	.0	2
Oswego	335	71	85	29.65	30.03	−.02	52.8	+1.6	75	8	60	31	27	46	31	47	43	72	3.35	+.1	12	9.3	se.	22	se.	30	10	15	6	5.3	T	.0	0
Rochester [1]	523	5	69	.....	30.03	−.02	52.4	+2.9	79	8	62	29	27	43	...	46	43	78	3.23	+.6	9	8.6	w.	34	sw.	27	9	7	15	.....	T	.0	0
Syracuse [1]	596	5	51	29.38	30.03	−.03	52.1	+2.6	75	8	63	31	27	42	38	46	43	80	2.99	+.2	11	9.1	sw.	34	se.	30	8	8	15	6.1	1.5	.0	0
Erie [2]	714	57	81	29.25	30.02	−.03	54.9	+1.5	79	8	62	27	27	48	29	48	45	84	4.36	+.7	15	8.1	sw.	22	sw.	22	6	6	19	7.3	1.0	.0	0
Cleveland [1]	762	27	54	29.19	30.02	−.04	54.7	+2.0	81	8	64	25	27	46	34	48	44	77	2.81	.0	9	10.1	sw.	33	sw.	21	9	8	14	6.2	T	.0	2
Sandusky	629	5	67	.....	.....	.....	55.4	+1.1	83	3	64	26	27	47	33	.....	.....	.....	1.48	−1.0	10	8.8	sw.	31	sw.	30	12	5	14	5.6	T	.0	1
Toledo [2]	628	79	87	29.33	30.02	−.03	54.0	+.6	82	8	62	28	26	46	30	47	44	82	2.21	−.2	11	8.6	w.	26	w.	27	15	2	14	4.9	.0	.0	1
Fort Wayne [1]	857	69	84	29.09	30.02	.....	53.0	+.3	81	8	63	21	26	43	34	46	43	80	1.93	−.7	11	7.6	w.	28	s.	30	10	8	13	6.0	.0	.0	2
Detroit [1]	730	5	78	29.22	30.02	−.03	53.4	+1.5	81	8	62	30	26	45	29	47	43	75	4.00	+1.6	12	9.3	sw.	33	se.	30	10	7	14	5.9	T	.0	4
Upper Lake Region							49.2	+1.2										79	2.15	−0.5									5.5			
Alpena	609	5	89	29.30	29.97	−.06	48.0	+.9	79	8	57	27	28	39	32	43	40	80	.79	−1.9	10	10.6	sw.	27	nw.	27	9	11	11	5.9	T	.0	1
Escanaba	612	51	72	29.28	29.95	−.06	47.6	+1.6	74	8	56	22	28	39	26	43	40	78	3.09	+.5	9	9.9	s.	36	s.	25	9	11	11	5.7	.5	.0	1
Grand Rapids [2]	707	70	244	29.21	29.98	−.06	52.6	+1.4	77	3	61	31	26	44	30	45	42	82	2.83	.0	12	11.0	sw.	44	sw.	30	12	6	13	5.7	T	.0	2
Lansing [2]	878	5	90	29.05	30.00	.....	50.6	+.3	78	8	60	28	28	42	33	45	42	80	3.36	+.9	13	8.2	sw.	32	s.	30	10	8	13	5.7	T	.0	2
Marquette	734	44	73	29.11	29.92	−.09	48.1	+1.4	77	20	56	21	26	40	31	42	38	75	2.55	−.2	9	8.2	w.	30	sw.	7	12	8	11	5.4	2.0	.0	0
Sault Sainte Marie [1]	614	11	43	29.26	29.94	−.07	46.0	+1.4	69	15	55	25	26	37	31	41	39	86	2.68	−.4	11	10.6	e	37	s	30	9	8	14	6.1	5.3	.0	3
Chicago [1]	673	.....	.....	29.27	30.00	−.04	53.3	+.8	83	8	63	22	26	43	33	46	43	76	1.44	−1.1	9	9.3	w	32	w	30	12	7	12	5.2	T	.0	1
Green Bay	617	109	141	29.29	29.97	−.05	49.8	+1.3	75	8	59	21	26	40	30	43	39	72	1.24	−1.3	7	10.0	w	29	w	3	12	8	11	5.3	T	.0	0
Milwaukee [1]	681	33	66	29.25	29.99	−.04	50.3	+.8	76	8	59	21	26	42	30	45	42	79	2.44	+.1	11	11.9	w.	48	sw.	30	13	6	12	5.2	T	.0	5
Duluth	1,133	5	47	28.71	29.94	−.06	46.2	+2.1	74	7	54	17	26	38	33	38	35	80	1.04	−1.3	6	12.5	nw.	35	nw.	25	14	7	10	4.8	2.2	.0	2
North Dakota							46.8	+3.3										69	0.55	−0.6									4.9			
Fargo [1]	940	5	43	28.93	29.96	−.04	47.2	+2.7	83	7	59	15	25	35	41	40	36	73	.81	−.9	7	11.3	nw.	41	nw.	20	12	9	10	4.9	2.2	T	0
Bismarck [1]	1,677	4	41	28.18	29.99	.00	47.1	+3.5	85	11	60	6	25	34	42	40	35	72	.71	−.2	5	9.9	nw.	42	nw.	20	13	7	11	5.0	1.5	.0	0
Devils Lake	1,478	11	44	28.36	29.95	−.04	46.3	+3.9	80	10	58	10	25	34	40	39	34	70	.23	−1.0	7	8.7	nw.	29	nw.	20	10	10	11	5.4	.7	.0	0
Lemmon, S. Dak	2,602	4	38	27.26	30.00	.....	47.0	.....	85	10	60	8	25	34	42	40	33	66	.29	.....	4	.....	nw.	.....	.....	.....	9	5	17	.....	.....	.0	0
Grand Forks	832	11	71	29.04	29.96	.....	46.2	.....	84	7	59	10	27	33	46	39	34	...	.09	.....	2	.....	nw.	.....	.....	.....	12	8	11	.....	T	.0	0
Williston	1,878	42	50	27.99	29.99	+.01	46.4	+3.0	87	10	58	10	25	35	47	39	33	66	.45	−.4	5	7.6	nw.	30	nw.	20	15	9	7	4.2	2.9	T	0
Upper Mississippi Valley							55.0	+1.4										71	1.85	−0.6									4.6			
Minneapolis-St. Paul, Minn. [1]	919	32	61	28.96	29.96	−.05	50.3	.....	78	2	60	18	26	40	35	42	38	71	.78	−1.3	6	9.4	w.	34	w.	25	15	5	11	4.5	.3	.0	2
Springfield, Minn	1,025	4	42	28.87	29.98	.....	49.7	.....	84	7	61	17	27	38	43	42	36	68	.34	.....	5	.....	nw.	.....	.....	.....	16	6	9	.....	T	.0	2
La Crosse [2]	714	11	48	29.19	29.97	−.05	51.1	+.8	75	8	62	20	26	40	32	43	38	75	2.71	+.4	8	4.8	w.	17	w..	25	17	5	9	4.0	T	.0	1
Madison [2]	974	70	78	28.93	29.99	−.04	51.6	+1.3	77	2	61	18	26	43	27	44	40	76	1.24	−1.2	9	7.9	w.	25	se	30	15	4	12	4.9	T	.0	3
Charles City	1,015	10	51	28.91	30.00	−.02	50.7	+2.1	80	1	62	17	26	39	38	43	38	73	2.63	+.3	8	5.8	nw.	21	w.	25	17	8	6	3.7	T	.0	2
Davenport [2]	606	66	161	29.35	30 02	−.02	55.4	+1.7	85	8	66	20	26	45	34	46	41	73	.79	−1.6	8	8.6	w.	24	sw.	30	11	10	10	5.1	T	.0	3
Des Moines [2]	860	5	99	28.96	30.00	−.03	55.2	+1.8	84	2	67	21	26	44	39	46	...	67	2.50	.0	7	8.5	nw.	27	nw.	23	18	7	6	.....	T	.0	1
Dubuque	699	60	79	29.24	29.99	−.05	52.8	+.9	79	2	63	18	26	42	32	45	40	69	2.50	.0	9	5.3	nw.	18	nw.	21	12	8	11	5.0	T	.0	4
Burlington, Iowa	702	6	35	29.24	30.00	−.05	54.6	−.2	83	8	67	18	26	42	37	46	41	71	.79	−1.9	8	8.0	s.	34	s.	30	29	13	11	7	4.5	T	.0	2
Cairo	358	87	93	29.65	30 03	−.04	61.6	+1.2	83	2	72	31	26	51	31	.....	.....	.....	1.96	−.8	9	6.9	n.	32	s.	30	12	10	9	4.8	.0	.0	1
Peoria [2]	609	11	45	29.37	30.02	−.03	55.2	+3.2	85	8	67	21	26	44	35	47	44	76	.96	−1.3	8	4.7	w.	20	s.	28	15	7	9	4.6	.0	.0	1
Springfield, Ill [2]	636	5	191	29.33	30.02	−.03	57.4	+1.6	84	2	67	24	26	48	35	47	43	76	3.07	+.5	8	10.5	w.	31	s.	30	11	10	10	5.2	T	.0	1
St. Louis [2]	568	179	303	29.41	30.02	−.04	60.0	+1.2	84	1	69	27	26	51	31	51	44	61	2.30	−.4	6	11.0	sw.	38	sw.	30	14	8	9	4.5	.0	.0	2
Missouri Valley							54.8	+1.8										70	1.65	−0.6									4.2			
Columbia, Mo. [2]	784	6	66	29.17	30.01	−.04	57.7	+1.1	83	7	69	24	26	47	32	49	45	73	1.43	−1.2	9	6.4	w.	24	nw.	22	14	9	8	4.6	.0	.0	0
Kansas City [1]	963	38	76	28.98	30.01	−.03	59.0	.....	85	9	69	27	26	49	32	51	46	69	2.68	−.2	5	8.9	sw.	33	sw.	21	15	7	9	4.1	.0	.0	1
St. Joseph [2]	967	11	49	28.98	30.01	.....	57.8	+1.8	89	2	69	23	26	47	32	49	45	76	1.74	−1.2	6	7.8	e.	22	nw.	25	19	5	7	3.7	.0	.0	0
Springfield, Mo. [1]	1,324	5	60	28.63	30.03	−.02	57.6	.....	82	2	69	21	26	46	33	50	46	74	3.68	+.6	8	8.9	se.	30	se.	28	13	7	11	4.8	T	.0	2
Topeka	987	65	87	28.96	30.01	.....	59.3	+2.3	85	2	70	25	26	48	34	51	46	70	2.75	−.3	8	7.4	s.	25	s.	29	16	9	6	3.9	.0	.0	0
Lincoln [2]	1,189	11	81	28.72	29.99	−.04	56.0	+1.8	87	2	68	20	26	44	35	46	40	66	.76	−1.1	6	8.3	s.	27	nw.	22	18	7	6	3.8	.0	.0	1
Omaha [1]	1,105	31	44	28.82	30.00	−.03	55.4	+2.0	84	2	67	21	26	44	37	46	40	66	1.01	−1.2	5	9.5	nw.	31	nw.	24	15	7	9	4.4	.0	.0	1
Valentine	2,598	46	54	27.28	30.02	−.01	50.2	+.9	91	7	64	14	26	36	45	41	33	60	.59	−.5	4	8.7	w.	34	nw.	24	11	9	11	5.1	T	.0	2
Sioux City [1]	1,138	5	27	28.78	30.00	−.02	52.6	+2.9	85	7	65	17	26	40	41	44	37	65	.58	−1.2	6	9.2	nw.	38	nw.	22	18	6	7	3.9	T	.0	1
Huron [1]	1,301	5	41	28.60	30.01	.00	49.2	+1.5	88	7	62	13	26	37	41	42	38	76	1.30	.0	6	10.8	nw.	40	w.	24	16	7	8	4.2	T	.0	2
Northern Slope							48.6	+2.8										64	1.53	+0.5									5.5			
Billings [1]	3,570	18	39	26.35	30.02	.....	50.8	+2.8	84	9	62	22	24	39	37	42	34	58	1.20	.....	6	12.0	sw.	50	nw.	24	8	13	10	5.4	.6	.0	0
Havre	2,507	11	67	27.36	30.00	+.02	48.0	+3.5	88	10	61	13	24	35	48	40	31	58	1.36	+.7	9	9.3	sw.	31	nw.	24	7	13	11	5.7	2.3	.0	1
Helena [1]	4,124	5	35	25.85	30.08	+.05	46.7	+2.9	84	9	59	13	25	34	50	39	32	60	.58	−.3	8	8.8	w.	49	nw.	24	11	8	12	5.9	T	.0	1
Missoula [2]	3,205	80	91	26.71	30.11	.....	49.0	+4.2	82	6	60	26	25	38	42	41	36	70	1.21	.0	10	5.7	se.	26	e.	22	10	6	15	6.0	.4	.0	0
Kalispell	2,973	48	56	26.99	30.06	+.05	45.5	+2.0	80	6	57	22	25	34	42	41	36	71	.74	−.3	9	5.1	nw.	20	w.	29	7	7	17	6.8	T	0	0
Miles City [2]	2,371	48	55	27.52	30.02	+.02	49.3	+2.8	90	10	62	14	25	37	45	41	34	66	.70	−.2	9	6.3	s.	34	nw.	24	15	7	9	4.8	.4	T	0
Rapid City [2]	3,259	50	58	26.64	30.03	+.02	49.7	+1.2	84	7	62	15	24	38	43	40	33	63	1.68	+.7	9	13.6	nw.	56	nw.	24	11	10	10	4.8	1.0	.0	0
Cheyenne [1]	6,094	5	39	24.03	30.02	+.01	46.3	.....	81	9	60	17	24	33	44	38	31	64	3.57	+2.6	7	10.1	nw.	41	nw.	31	12	10	9	5.2	6.3	.0	3
Lander	5,352	60	68	24.72	30.06	+.02	45.6	+2.1	80	7	59	19	25	32	40	38	31	63	3.40	+2.0	9	4.3	sw.	25	sw.	10	14	6	11	5.0	6.3	.0	1
Sheridan [2]	3,790	5	38	26.15	30.05	.....	48.4	+3.8	86	10	62	20	24	35	45	40	33	63	2.02	+1.0	11	7.7	nw.	49	nw.	21	11	8	12	5.6	1.8	.0	0
North Platte [2]	2,821	11	51	27.06	29.99	−.03	52.7	+3.0	91	7	66	16	25	39	46	42	37	67	.01	−1.1	1	6.9	w.	27	n.	21	12	10	9	4.9	T	.0	0
Middle Slope							57.3	+0.9										69	2.82	+0.9									4.9			
Denver [1]	5,292	106	113	24.76	30.00	−.01	51.4	+1.9	82	10	62	22	24	41	38	41	33	62	3.72	+2.7	8	7.0	s.	25	nw.	30	13	8	10	4.7	10.6	.0	2
Pueblo [1]	4,690	5	36	25.30	29.98	−.01	52.4	+1.2	84	7	67	25	26	38	48	42	34	59	1.94	+1.3	6	7.7	nw.	49	w.	31	10	9	12	5.3	.5	.0	1
Concordia	1,392	50	58	28.54	30.02	−.01	57.2	+1.3	86	8	68	21	26	46	39	49	44	69	1.36	−.6	8	6.5	w.	20	n.	22	13	10	8	4.5	.0	.0	1
Dodge City [1]	2,509	10	86	27.40	29.99	−.03	57.2	+1.1	88	1	69	30	26	46	39	49	45	73	3.60	+2.3	10	13.1	s.	36	n.	4	10	11	10	5.1	T	.0	1
Wichita [1]	1,358	6	64	28.57	30.00	−.03	58.9	+.3	82	9	69	28	26	49	33	51	48	76	3.77	+1.2	8	12.5	s.	39	s.	3	13	7	11	5.0	.0	.0	2
Oklahoma City [2]	1,214	10	47	28.72	30.00	−.03	62.0	+.5	84	9	71	29	26	52	30	54	50	71	2.50	−.4	9	7.5	s.	24	sw.	29	16	3	12	4.7	.0	.0	3
Tulsa [1]	.....	.....	.....	29.28	30.00	.....	61.7	+.1	83	10	72	28	26	51	32	54	50	74	2.86	−.5	9	8.7	s.	30	sw.	29	14	5	12	5.1	.0	.0	3

See footnotes at end of table.

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS—Continued

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to means of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max.+mean min.÷2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean wet thermometer temperature of the dewpoint	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01 inch or more	Wind: Average hourly velocity	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month	Number of days with thunderstorms
Southern Slope	*Ft.*	*Ft.*	*Ft.*	*In.*	*In.*	*In.*	*°F.*	*°F.*	*°F.*		*°F.*	*°F.*		*°F.*	*°F.*	*°F.*	*K*	*In.*	*In.*		*Miles*								*0–10*	*In.*	*In.*	
							63.0	**−0.1**									**71**	**3.63**	**+1.8**										**4.8**			
Abilene [2]	1,738	10	56	28.19	29.98	−.03	64.4	−1.0	87	4	76	35	26	53	30	56	52	74	5.37	+2.9	6	8.3	s.	28	w.	29	9	11	11	5.1	0.0	0.0	5
Amarillo [2]	3,676	10	49	26.28	29.99	−.01	56.8	−.9	84	1	68	33	31	46	37	50	46	78	0.18	+4.5	4	13.2	s.	40	sw.	29	13	8	10	4.9	.0	.0	2
Del Rio	960	63	71	28.96	29.94	−.04	71.2	+1.2	91	22	86	49	31	62	39	62	58	68	1.58	−.2	5	8.1	se.	31	nw.	30	10	10	11	5.5	.0	.0	4
Roswell	3,566	75	85	26.38	29.97	+.01	59.8	+.3	86	9	73	35	27	46	45	50	44	64	1.39	.0	6	7.0	s.	31	sw.	29	15	14	2	3.8	.0	.0	3
Southern Plateau							**66.5**	**+2.2**									**45**	**0.56**	**0.0**										**3.3**			
El Paso [2]	3,778	82	101	26.19	29.93	+.01	64.8	+1.3	86	1	76	43	26	53	34	51	43	53	1.53	+.7	4	7.5	e.	28	sw.	12	12	13	6	4.1	.0	.0	3
Albuquerque [1]	5,314	5	45	24.76	29.92	.....	57.8	+1.2	82	9	70	33	31	46	35	46	36	52	.73	−.1	7	8.0	se.	34	se.	5	12	12	7	4.7	.0	.0	4
Flagstaff	6,907	10	59	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Phoenix [2]	1,107	39	87	28.75	29.88	.00	72.3	+1.7	98	5	86	44	31	58	36	55	44	45	.43	.0	3	4.8	e.	23	e.	18	20	9	2	2.6	.0	.0	2
Tucson [1]	2,555	5	23	27.32	29.89	.....	69.4	.....	94	1	83	38	31	56	39	54	42	42	.60	+.1	6	.....	se.	.....	.....	.....	17	10	4	3.5	.0	.0	4
Yuma	142	9	54	29.72	29.87	.00	75.4	+2.1	104	5	91	48	30	60	42	60	49	45	.04	−.2	1	5.1	n.	28	w.	12	25	4	2	1.5	.0	.0	1
Independence	3,957	5	26	26.01	30.03	+.08	62.3	+4.8	88	5	77	33	30	48	37	46	31	33	T	−.3	0	.....	n.	.....	.....	.....	27	4	0	.....	.0	.0	0
Middle Plateau							**52.1**	**+2.0**									**51**	**0.40**	**−0.3**										**2.8**			
Reno [2]	4,527	61	76	25.54	30.08	+.09	51.6	+.8	88	5	73	18	29	30	56	41	31	54	.07	−.3	3	4.9	sw.	28	nw.	11	18	10	3	2.8	T	.0	0
Tonopah	6,090	9	20	24.10	30.01	.....	53.9	.....	77	5	65	27	28	43	28	42	29	44	.15	−.1	2	.....	nw.	.....	.....	.....	22	8	1	.....	T	.0	0
Winnemucca	4,339	5	56	25.70	30.08	+.03	51.1	+2.8	86	6	70	18	28	32	51	40	28	47	.28	−.3	3	6.6	ne.	22	sw.	31	20	7	4	2.8	T	.0	1
Modena	5,473	10	46	.....	30.02	+.06	50.2	+2.2	82	6	66	19	29	34	.....	.....	.....	56	.82	+.1	6	8.1	w.	27	sw.	10	17	7	7	.....	.9	.0	3
Salt Lake City [1]	4,227	86	47	25.66	30.04	+.03	52.7	+1.9	83	9	66	28	25	40	40	44	35	55	.57	−.7	7	8.2	se.	28	s.	10	16	2	13	4.3	T	.0	1
Grand Junction	4,602	60	68	25.40	29.97	−.02	55.1	+2.3	82	1	68	27	30	42	39	44	34	52	.53	−.4	8	5.3	se.	25	w.	28	13	12	6	4.2	.0	.0	2
Northern Plateau							**52.3**	**+3.1**									**60**	**0.82**	**−0.4**										**4.6**			
Baker [2]	3,471	36	54	26.53	30.11	+.03	49.2	+2.6	83	6	64	19	28	35	40	40	33	65	.59	−.3	7	6.1	s.	23	sw.	26	16	8	7	4.1	T	.0	0
Boise [1]	2,739	5	49	27.23	30.07	+.01	52.6	+2.5	87	9	66	21	28	39	41	45	37	58	.58	−.7	4	9.0	se.	28	se.	9	19	3	9	3.5	T	.0	1
Pocatello [1]	4,478	5	31	25.53	30.06	+.02	50.2	+3.7	85	9	64	23	26	37	48	41	32	55	.38	−1.3	7	9.3	sw.	30	sw.	27	14	7	10	4.6	T	.0	3
Spokane [1]	1,929	27	42	28.02	30.07	+.01	50.4	+2.1	79	9	64	26	25	37	40	44	38	66	1.12	.0	8	6.2	ne.	28	sw.	31	10	9	12	5.5	.0	.0	1
Walla Walla	991	57	65	29.01	30.07	.00	57.4	+3.9	85	9	68	34	28	46	31	.....	.....	.....	2.18	+.6	7	5.2	s.	23	w.	26	13	11	7	4.5	.0	.0	0
Yakima	1,076	58	67	28.92	30.07	.....	54.1	+3.9	81	6	68	29	28	41	36	46	38	58	.08	−.5	2	4.8	nw.	24	sw.	10	12	5	14	5.4	.0	.0	0
North Pacific Coast Region							**55.6**	**+3.2**									**78**	**3.42**	**−0.4**										**6.2**			
North Head	211	5	56	29.85	30.08	+.03	55.0	+2.1	73	16	60	41	28	50	23	52	50	86	5.93	+.9	20	12.4	s.	54	s.	10	7	10	14	6.9	.0	.0	0
Seattle [2]	125	90	321	29.94	30.08	+.03	55.4	+4.0	74	4	62	37	28	48	26	50	47	79	1.68	−1.2	10	7.6	s.	34	s.	31	6	7	18	7.0	.0	.0	0
Tacoma	194	172	201	29.88	30.09	+.05	54.4	+3.9	76	17	62	34	28	47	30	.....	.....	.....	3.17	−.2	9	6.8	s.	29	sw.	10	4	9	18	7.3	.0	.0	0
Tatoosh Island	86	9	61	.....	30.07	+.06	53.4	+3.5	65	9	57	44	28	49	.....	.....	85	7.61	−.5	18	14.5	e.	47	s.	6	4	10	17	.....	.0	.0	0
Medford [1]	1,329	29	58	28.69	30.10	.....	56.3	+2.7	90	5	71	34	28	41	44	49	42	66	.82	−.5	6	.....	.....	.....	.....	.....	15	6	10	4.2	.0	.0	0
Portland, Oreg. [3]	154	68	106	29.92	30.09	+.03	57.4	+3.2	80	5	65	39	28	50	28	52	48	79	3.75	+.6	10	4.9	nw.	19	se.	28	9	8	14	6.1	.0	.0	1
Roseburg	510	45	76	29.56	30.11	+.03	57.0	+3.1	89	5	69	30	13	45	44	51	46	71	.99	−1.6	8	3.1	di.	18	sw.	26	11	8	12	5.5	.0	.0	0
Middle Pacific Coast Region							**62.1**	**+1.8**									**66**	**0.94**	**−0.3**										**3.9**			
Eureka	60	72	88	30.04	30.11	+.05	53.9	+.3	71	21	60	40	28	48	20	51	49	87	1.21	−1.1	8	5.0	n.	24	n.	28	7	10	14	6.1	.0	.0	0
Redding [1]	722	20	34	29.24	30.01	.....	68.2	+3.9	96	4	79	45	28	57	30	53	40	41	1.35	−.7	5	8.2	nw.	24	nw.	2	21	3	7	2.8	.0	.0	0
Sacramento [3]	66	92	115	29.92	29.99	.00	65.4	+2.5	91	4	79	44	31	52	35	55	47	59	.27	−.6	4	5.9	s.	23	n.	28	21	7	3	2.7	.0	.0	1
San Francisco	155	112	132	29.85	30.02	+.01	60.9	+.4	82	21	68	51	28	54	29	55	52	79	.95	−.2	4	7.3	w.	23	w.	4	17	8	6	4.1	.0	.0	0
South Pacific Coast Region							**66.3**	**+2.4**									**63**	**0.42**	**−0.3**										**3.6**			
Fresno [1]	327	5	35	29.64	29.99	+.03	65.4	+3.1	93	5	80	39	30	51	38	55	45	54	T	.6	0	4.7	nw.	19	nw.	12	21	7	3	2.5	.0	.0	0
Los Angeles	338	223	250	29.61	29.96	+.01	67.6	+2.3	95	21	77	48	29	58	30	57	50	61	.58	−.1	2	6.3	w.	29	nw.	12	15	11	5	4.0	.0	.0	0
San Diego [1]	87	20	55	29.87	29.97	+.02	66.0	+1.9	90	21	74	48	29	58	32	59	55	73	.27	−.3	2	6.6	s.	20	s.	28	14	10	7	4.2	.0	.0	0
West Indies																																	
San Juan, P. R.	82	10	54	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Panama Canal																																	
Balboa Heights	118	6	92	(5)	(5)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(5)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cristobal	27	47	97	(5)	(5)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(5)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Alaska																																	
Anchorage	135	36	47	.....	[4]29.54	.....	37.5	+1.4	55	1	43	17	31	32	...	35	32	83	2.36	+.2	13	5.2	n.	24	n.	12	4	5	22	.....	8.6	.0	0
Fairbanks [1]	484	11	87	.....	[4]29.64	.....	28.0	+1.4	63	2	35	3	12	21	...	28	26	58	.91	+.1	12	4.8	n.	21	e.	23	4	3	24	.....	9.1	4.8	0
Juneau	132	96	116	.....	[4]29.75	.....	45.2	+1.8	55	2	49	32	31	42	...	43	40	84	17.15	+5.6	27	8.7	se.	32	e.	4	0	2	29	.....	.0	.0	0
Hawaiian Islands																																	
Honolulu	38	86	100	29.91	29.95	.....	78.0	+1.2	86	25	83	69	29	74	13	70	67	73	3.85	+2.3	14	8.5	ne.	24	e.	2	5	16	10	6.0	.0	.0	1

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Alaska																																	
Anchorage	135	36	47	[4]29.69	[4]29.91	.....	51.6	.....	71	22	58	28	15	45	23	49	46	79	3.41	.....	19	5.1	n.	23	se.	20	4	6	20	7.8	.0	.0	.....
Bethel	22	5	32	[4]29.74	[4]29.78	.....	48.8	.....	64	23	55	31	15	43	31	47	45	83	4.12	.....	23	.....	s.	.....	.....	.....	2	5	23	8.4	.0	.0	.....
Fairbanks	484	11	87	[4]29.37	[4]29.89	.....	48.8	.....	70	1	58	26	17	39	34	46	42	74	2.85	.....	14	4.8	e.	19	w.	14	5	3	25	7.7	T	.0	.....
Juneau	132	96	116	[4]29.94	[4]30.03	.....	53.1	.....	74	2	59	38	17	47	28	50	47	83	8.39	.....	16	4.6	s.	28	se.	11	5	5	20	7.6	.0	.0	.....
Ketchikan	75	69	85	[4]30.02	[4]30.04	.....	56.6	.....	79	2	64	43	17	50	30	52	49	79	8.05	.....	13	6.3	se.	24	nw.	22	8	8	14	6.5	.0	.0	.....
McGrath	331	4	31	[4]29.46	[4]29.83	.....	48.4	.....	70	1	57	25	15	40	29	50	43	88	2.97	.....	14	.....	sw.	30	s.	24	4	6	20	.....	T	.0	.....
Nome	43	25	51	[4]29.75	[4]29.77	.....	45.8	.....	61	10	51	29	19	41	22	45	42	86	5.20	.....	21	12.9	ne.	37	se.	24	4	6	20	7.8	.1	.0	.....

[1] Data are airport records.
[2] Barometric data (adjusted to old city elevation) and hygrometric data from airport; otherwise city office records.
[3] Observations taken hourly.
[4] Pressure not reduced to a mean of 24 hours.
[5] Barometric data from airport; other data from city office records.
[6] Wind, clear, partly cloudy and cloudy data from city office records; other data from airport.

NOTE.—Except as indicated by notes 1, 2, 5 and 6 data in table are city office records.

SEVERE LOCAL STORMS, OCTOBER 1942

[Severe local storms for October 1942 delayed, but will appear as "Late Reports" in the Monthly Weather Review for November 1942]

SOLAR RADIATION AND SUNSPOT DATA FOR OCTOBER 1942

[Solar Radiation Investigations Section, I. F. HAND in charge]

SOLAR RADIATION OBSERVATIONS

Explanations of the tables and references to descriptions of instruments, stations and methods of observation, and to summaries of data, are given in the January 1942 REVIEW, p. 20.

TABLE 1.—*Solar radiation intensities during October, 1942*

[Gram-calories per Minute per Square Centimeter of Normal Surface]

LINCOLN, NEBR.

Date	Sun's zenith distance: 7:30 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	1:30 p. m.
	75th mer. time	Air mass: A. M.					P. M.				Local mean solar time
	e.	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e.
	mm.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm.*
Oct. 1	7.92	0.79	0.92	1.06	1.21	.....	1.01	0.84	0.71	0.62	11.07
Oct. 2	8.53	.64	.75	.88	1.08	.....	.....	.....	.....	.....	11.07
Oct. 5	7.06	.81	.94	1.12	1.27	.....	1.25	1.10	.99	.89	7.62
Oct. 6	6.80	.88	.96	1.07	1.28	.....	1.23	1.01	.88	.79	9.90
Oct. 7	8.53	.83	.94	1.07	1.21	.....	1.17	.97	.82	.69	11.89
Oct. 9	6.80	.54	.66	.79	.96	.....	.....	.....	.....	.....	5.82
Oct. 10	6.80	.56	.69	.86	1.10	.....	1.12	.88	.73	.58	7.92
Oct. 12	7.92	.56	.64	.83	1.06	.....	1.08	.84	.69	.....	8.53
Oct. 13	7.62	.49	.60	.79	1.01	.....	.94	.75	.58	.45	8.53
Oct. 14	6.81	.41	.52	.62	.94	.....	1.08	.82	.69	.60	7.06
Oct. 20	4.98	.83	.94	1.07	1.28	.....	1.19	.88	.62	.....	7.62
Oct. 25	4.37	.....	.....	.....	1.34	.....	1.36	1.20	1.07	.94	2.49
Oct. 26	1.85	.83	1.01	1.18	1.31	.....	1.27	.....	.....	.....	2.49
Oct. 27	2.62	.77	.94	1.09	1.27	.....	1.22	1.01	.90	.77	3.15
Oct. 31	2.74	.....	.....	.....	.....	.....	1.35	1.22	1.07	.....	3.99
Means	.....	**.69**	**.81**	**.96**	**1.17**	.....	**1.17**	**.96**	**.81**	**.70**	.....
Departures	.....	**−.12**	**−.11**	**−.12**	**−.10**	.....	**−.08**	**−.11**	**−.12**	**−.13**	.....

MADISON, WIS.

Oct. 2	8.53	.....	0.51	0.60	0.84	1.27	0.87	.....	.....	.....	11.07
Oct. 6	7.34	0.74	.88	1.08	1.22	1.44	1.24	.....	.....	.....	8.23
Oct. 7	5.59	.91	1.02	1.10	1.21	1.55	1.33	.....	.....	.....	5.59
Oct. 8	9.20	.....	.60	.80	.96	1.16	.....	.....	.....	.....	10.67
Oct. 9	6.04	.....	1.01	1.14	1.26	1.48	1.22	.....	.....	.....	6.81
Oct. 10	5.18	.77	.87	.96	1.04	1.14	.....	.....	.....	.....	7.92
Oct. 12	6.30	.69	.80	.92	1.15	1.39	1.08	.....	.....	.....	8.53
Oct. 13	6.55	.60	.64	.86	1.07	1.28	.95	.....	.....	.....	8.86
Oct. 17	5.82	.57	.79	.95	1.16	1.41	.....	.....	.....	.....	7.92
Oct. 20	6.55	.....	.84	.98	1.15	1.46	1.22	.....	.....	.....	6.30
Oct. 27	2.74	.75	.87	1.03	1.19	1.51	1.24	.....	.....	.....	3.15
Oct. 31	4.78	.....	.98	1.11	.....	.....	.....	.....	.....	.....	4.57
Means	.....	**.72**	**.82**	**.96**	**1.11**	**1.37**	**1.14**	.....	.....	.....	.....
Departures	.....	**−.06**	**−.09**	**−.08**	**−.09**	**−.07**	**−.07**	.....	.....	.....	.....

TABLE 1.—*Solar radiation intensities during October, 1942*—Con.

BLUE HILL, MASS.

Date	Sun's zenith distance: 7:30 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	1:30 p. m.
	75th mer. time	Air mass: A. M.					P. M.				Local mean solar time
	e.	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e.
	mm.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm.*
Oct. 1	9.4	0.68	0.80	0.92	.....	.....	.....	0.67	0.54	0.26	9.0
Oct. 2	6.6	.79	.94	.....	.....	.....	1.19	1.05	.92	.82	10.1
Oct. 3	7.4	.....	.....	.....	.....	.....	1.21	1.05	.96	.86	9.4
Oct. 4	7.4	.....	.96	1.12	1.26	.....	.....	.....	.....	.....	8.0
Oct. 7	8.4	.....	.....	.....	1.19	.....	.....	.87	.70	.59	9.0
Oct. 8	8.4	.89	1.00	1.12	1.24	1.32	1.15	.99	.91	.83	8.4
Oct. 10	10.9	.43	.58	.74	1.00	1.31	.....	.....	.....	.....	10.1
Oct. 12	9.0	.83	.....	1.08	.....	.....	.....	.....	.....	.....	8.7
Oct. 13	9.4	.....	.....	.....	.....	1.36	1.27	1.10	.98	.....	9.4
Oct. 19	8.0	.87	.97	1.13	.....	.....	.....	.....	.....	.....	6.6
Oct. 21	10.5	.....	.....	.....	1.02	.....	.....	.....	.....	.....	9.4
Oct. 27	5.6	.....	.95	1.06	.....	.....	.....	.....	.84	.86	3.8
Oct. 28	4.6	.80	.92	1.04	.....	.....	1.14	.....	.80	.67	5.1
Oct. 30	10.5	.....	.....	.....	.....	.....	.....	1.00	.90	.80	11.7
Oct. 31	14.6	.....	.....	.....	.....	.....	.....	.92	.81	.72	12.6
Means	.....	**.76**	**.89**	**1.03**	**1.14**	**1.33**	**1.19**	**.96**	**.84**	**.71**	.....
Departures	.....	**−.12**	**−.07**	**−.06**	**−.09**	**−.05**	**−.01**	**−.06**	**−.07**	**−.08**	.....

ALBUQUERQUE, N. MEX.

Oct. 1	4.17	.....	1.08	1.19	1.31	1.41	1.27	1.09	0.92	0.91	5.16
Oct. 3	7.04	.....	.....	.....	1.08	1.39	.....	.....	.....	.76	5.56
Oct. 4	5.36	.....	.....	.....	1.34	1.54	1.36	1.22	1.13	1.01	3.45
Oct. 5	4.95	.....	1.02	1.15	1.31	1.56	1.26	1.14	1.01	.87	4.57
Oct. 6	6.27	0.70	.80	.93	1.08	.....	1.14	.....	.....	.....	8.48
Oct. 7	6.50	.79	.80	.94	1.15	.....	.....	.....	.....	.....	8.48
Oct. 8	7.04	.78	.88	1.03	.....	.....	.....	.....	.....	.....	7.04
Oct. 9	5.56	.82	.92	1.03	.....	.....	.....	.....	.....	.....	6.02
Oct. 12	8.48	.....	.....	.....	1.27	.....	.....	.....	.....	.....	8.48
Oct. 14	7.04	.....	.....	.....	1.26	1.54	.....	.....	.....	.....	6.02
Oct. 19	6.50	.....	.96	.....	.....	.....	1.26	.....	.....	.....	6.27
Oct. 20	5.56	.....	.....	1.17	1.33	.....	.....	.....	.....	.....	6.27
Oct. 23	3.99	.....	.....	.....	.....	.....	.....	.....	.....	.....	3.81
Oct. 24	6.02	.....	.....	.....	1.31	.....	1.30	1.17	1.01	.....	5.56
Oct. 25	5.56	.86	1.00	1.13	1.30	1.44	1.35	1.25	1.17	1.04	5.36
Oct. 26	4.95	.98	1.10	1.22	1.38	1.47	1.39	1.23	1.12	.99	4.37
Oct. 27	4.17	.97	1.08	1.18	1.35	1.47	1.32	.....	.....	.98	3.99
Oct. 30	4.57	.....	1.17	1.26	1.35	.....	.....	1.22	1.08	.96	3.99
Oct. 31	3.45	.....	.....	1.22	.....	.....	.....	.....	1.14	1.05	3.00
Means	.....	**.84**	**.98**	**1.12**	**1.27**	**1.48**	**1.29**	**1.19**	**1.07**	**.95**	.....
Departures	.....	**−.07**	**−.04**	**−.03**	**−.03**	**−.05**	**−.03**	**+.01**	**.00**	**.00**	.....

*Extrapolated.

TABLE 2.—*Daily totals and weekly means of solar radiation (direct+diffuse) received on a horizontal surface*

[Gram-calories per square centimeter]

Date	Washington	Madison	Lincoln	Chicago	New York	Fresno	Cambridge	Fairbanks	Nashville	Twin Falls	New Orleans	Riverside	Blue Hill	Friday Harbor	Ithaca	Newport	State College	Put-in-Bay	San Juan u. v. below 3132 Å	Davis, Calif.	East Wareham
	cal.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*milli-cal.*		
Oct. 1	406	267	411	319	306	466	393	-------	353	364	521	464	413	276	353	457	302	304	168	480	443
2	346	365	393	329	408	456	420	-------	252	447	478	429	428	116	385	-------	328	233	184	504	461
3	268	171	174	212	441	446	335	-------	213	374	386	377	329	315	420	341	184	352	367	484	190
4	162	215	230	104	257	430	378	-------	58	423	252	437	413	195	73	426	32	234	378	431	417
5	38	324	436	156	55	433	164	-------	294	417	336	445	139	331	370	58	232	88	421	453	81
6	453	411	420	413	232	422	345	-------	340	406	537	416	300	226	109	344	208	436	258	454	334
7	425	413	411	310	351	410	388	-------	304	393	518	238	403	343	285	416	316	417	382	441	420
Mean	**300**	**310**	**354**	**263**	**293**	**437**	**346**	**101**	**259**	**403**	**433**	**401**	**346**	**257**	**285**	**340**	**229**	**308**	**363**	**465**	**335**
Departure	**−29**	**+30**	**+21**	**−1**	**−13**	**+13**	**+78**	**−15**	-------	**+37**	**+65**	**+20**	**+39**	**+2**	**−6**	**+52**	**−51**	-------	-------	-------	-------
8	392	242	307	370	362	414	380	-------	330	384	508	363	403	69	422	423	370	379	412	433	421
9	389	399	380	368	316	329	321	-------	211	363	441	264	338	-------	169	330	248	118	205	421	328
10	340	366	386	416	364	361	350	-------	180	216	501	345	382	-------	368	348	361	405	254	135	356
11	306	364	368	360	348	245	347	-------	265	262	409	352	381	353	424	324	371	401	302	-------	324
12	211	353	372	393	280	422	312	-------	240	42	295	267	361	316	369	363	364	400	408	458	373
13	43	336	360	339	283	408	345	-------	218	187	434	444	392	238	404	401	124	317	308	402	410
14	28	300	361	192	91	358	184	-------	224	300	448	436	249	155	149	264	31	45	274	143	268
Mean	**244**	**337**	**362**	**348**	**292**	**362**	**320**	**91**	**239**	**250**	**442**	**353**	**358**	**226**	**330**	**352**	**267**	**298**	**326**	**332**	**354**
Departure	**−65**	**+86**	**+58**	**+109**	**−2**	**−36**	**+36**	**−3**	-------	**−99**	**+66**	**−15**	**+37**	**+4**	**+52**	**+26**	**+16**	-------	-------	-------	-------
15	52	106	322	34	57	359	218	-------	243	129	459	422	229	195	152	215	36	45	330	461	150
16	62	234	125	38	66	391	190	-------	240	358	449	455	183	274	88	261	39	87	350	438	129
17	184	339	304	316	108	389	272	-------	235	349	433	419	350	281	32	279	178	60	-------	424	272
18	351	325	212	258	241	384	156	-------	273	353	423	417	151	212	280	199	310	364	-------	-------	200
19	387	347	341	278	393	377	279	-------	176	352	363	383	261	118	170	359	362	310	275	-------	318
20	362	330	355	321	308	389	148	-------	80	333	290	406	173	246	365	140	328	326	265	408	200
21	103	123	184	152	58	386	202	-------	197	305	-------	409	249	230	118	226	85	90	136	403	248
Mean	**214**	**258**	**263**	**200**	**176**	**382**	**209**	**73**	**206**	**311**	**404**	**416**	**228**	**222**	**172**	**240**	**191**	**183**	**282**	**427**	**217**
Departure	**−69**	**+34**	**−27**	**−10**	**−92**	**+22**	**−59**	**+3**	-------	**−10**	**+46**	**+70**	**−59**	**+30**	**−90**	**−50**	**−32**	-------	-------	-------	-------
22	325	118	262	50	306	378	193	-------	33	329	-------	411	178	147	248	146	255	47	208	379	128
23	151	150	380	158	112	364	157	-------	189	308	351	390	174	301	154	198	167	317	231	384	202
24	320	299	279	296	284	317	167	-------	267	339	399	252	171	234	321	91	300	336	306	249	68
25	66	254	336	146	194	316	81	-------	143	336	58	349	62	238	280	72	120	197	249	322	74
26	34	344	335	329	26	327	40	-------	293	329	-------	389	56	79	14	66	39	315	203	304	85
27	380	322	331	286	314	268	305	-------	283	195	466	161	324	257	170	345	255	160	321	361	335
28	355	202	52	197	310	236	288	-------	248	299	-------	84	326	68	297	327	317	303	278	310	324
Mean	**233**	**241**	**282**	**209**	**221**	**315**	**176**	**55**	**208**	**305**	**318**	**288**	**184**	**189**	**212**	**178**	**208**	**239**	**260**	**327**	**174**
Departure	**−28**	**+33**	**+7**	**+26**	**−16**	**−31**	**−34**	**−6**	-------	**+25**	**−12**	**−34**	**−39**	**+31**	**+38**	**−56**	**+14**	-------	-------	-------	-------

ACCUMULATED DEPARTURES ON OCTOBER 28, 1942

	+280	**−2975**	**−8750**	**+4683**	**−3584**	**+1715**	**−4998**	**+4753**	-------	**+2086**	**+10535**	**+10577**	**−10661**	**−1183**	**−1505**	**−4956**	**−7763**	-------	-------	-------	-------

POSITIONS, AREAS, AND COUNTS OF SUNSPOTS FOR OCTOBER 1942

[Communicated by Capt. J. F. Hellweg, U. S. N. (Ret.), Superintendent, U. S. Naval Observatory.] All measurements and spot counts were made at the Naval Observatory from plates taken at the observatories indicated. Difference in longitude is measured from the central meridian, positive toward the west. Latitude is positive toward the north. Areas are corrected for foreshortening and expressed in millionths of Sun's hemisphere. For each day, under longitude, latitude, area of spot or group, and spot count, are included assumed longitude of center of the disk, assumed latitude of center of the disk, total area of spots and groups, and total spot count.

Date	Eastern standard time	Mount Wilson group No.	Heliographic: Difference in longitude	Heliographic: Longitude	Heliographic: Latitude	Heliographic: Distance from center of disk	Area of spot or group	Spot count	Plate quality	Observatory
1942	*h m*		°	°	°	°				
Oct. 1	11 2	7493	−41	197	+11	41	24	3	F	U. S. Naval.
		7491	+55	293	−6	57	97	8		
		7491	+58	296	−7	60	48	7		
				(238)	(+7)	-------	169	18		
Oct. 2	11 35	7493	−27	197	+11	23	24	1	VG	Do.
		7491	+70	294	−8	71	24	2		
				(224)	(+7)	-------	48	3		
Oct. 3	10 22	7493	−13	198	+10	14	12	1	G	Do.
				(211)	(+7)	-------	12	1		
Oct. 4	9 22	-------	-------	No spots		-------	-------	-------	VG	Mt. Wilson.
Oct. 5	9 24	7495	−22	164	+8	22	24	5	VG	Do.
		7494	−1	185	+5	12	12	2		
				(186)	(+7)	-------	36	7		

POSITIONS, AREAS, AND COUNTS OF SUNSPOTS FOR OCTOBER 1942—Continued

Date	Eastern standard time	Mount Wilson group No.	Heliographic: Difference in longitude	Heliographic: Longitude	Heliographic: Latitude	Heliographic: Distance from center of disk	Area of spot or group	Spot cont	Plate quality	Observatory
1942	*h m*		°	°	°	°				
Oct. 6	9 28	-------	-------	No spots		-------	-------	-------	G	Mt. Wilson.
Oct. 7	11 17	7495	−4	154	+8	4	6	1	G	U. S. Naval.
		7495	+6	164	+8	6	12	1		
		7497	+8	166	−7	16	12	2		
		7496	+13	171	−12	22	48	8		
				(158)	(+6)	-------	78	12		
Oct. 8	11 11	7499	−71	74	−11	72	24	8	G	Do.
		(*)	−25	120	−8	29	12	2		
		7498	+10	155	+6	10	24	5		
		7493	+18	163	+8	18	6	2		
		7496	+28	173	−12	33	36	5		
				(145)	(+6)	-------	102	22		
Oct. 9	10 32	7500	−87	45	−9	87	97	1	G	Do.
		7499	−58	74	−11	60	48	9		
		7498	+23	155	+6	23	18	5		
		7496	+41	173	−12	46	24	3		
				(132)	(+6)	-------	187	18		
Oct. 10	10 21	7500	−73	46	−10	75	242	1	G	Do.
		7499	−45	74	−11	49	48	5		
		7501	+51	170	−9	54	48	7		
		7496	+55	174	−12	58	12	3		
				(119)	(+6)	-------	350	16		

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POSITIONS, AREAS, AND COUNTS OF SUNSPOTS FOR OCTOBER 1942—Continued

Date	Eastern standard time	Mount Wilson group No.	Heliographic				Area of spot or group	Spot count	Plate quality	Observatory
			Difference in longitude	Longitude	Latitude	Distance from center of disk				
1942	*h m*		°	°	°	°				
Oct. 11...	11 22	7500	−60	45	−11	62	242	1	F	U. S. Naval.
		7499	−32	73	−11	36	12	3		
		(*)	+60	165	+4	60	12	1		
		7501	+64	169	−10	66	145	5		
				(105)	(+6)	.....	411	10		
Oct. 12...	11 8	7500	−47	45	−11	50	242	1	G	Do.
		7501	+80	172	−11	80	242	6		
				(92)	(+6)	.....	.....	.....		
Oct. 13...	10 23	7500	−34	46	−11	38	242	1	VG	Mt. Wilson.
				(80)	(+6)	.....	242	1		
Oct. 14...	10 46	7500	−20	46	−11	26	242	1	G	Do.
				(66)	(+6)	.....	242	1		
Oct. 15...	10 19	7500	−7	46	−12	20	291	1	VG	Do.
				(53)	(+6)	.....	291	1		
Oct. 16...	10 40	7500	+7	47	−12	20	.....	.....	.....	Do.
				(40)	(+6)					
Oct. 17...	10 17	7500	+20	47	−11	27	242	1	F	U. S. Naval.
				(27)	(+6)	.....	242	1		
Oct. 18...	11 8	7502	−81	292	+6	81	24	2	G	Do.
		(*)	−63	310	−6	64	12	3		
		7500	+33	46	−11	37	194	1		
				(13)	(+6)	.....	230	6		
Oct. 19...	10 28	7502	−69	291	+6	69	48	9	G	Do.
		(*)	−50	310	−7	52	24	4		
		(*)	+26	26	+7	27	6	2		
		7500	+47	47	−12	50	194	1		
				(0)	(+6)	.....	272	16		
Oct. 20...	11 55	7502	−52	294	+5	52	61	8	G	Do.
		7500	+60	46	−12	62	194	1		
				(346)	(+5)	.....	255	9		
Oct. 21...	15 11	7502	−37	294	+5	37	121	12	F	Do.
		7500	+75	46	−12	77	194	1		
				(331)	(+5)	.....	315	13		
Oct. 22...	12 10	7504	−51	269	+9	51	48	4	F	Do.
		7502	−25	295	+5	25	73	5		
		7503	−8	312	−3	11	12	3		
				(320)	(+5)	.....	133	12		
Oct. 23...	14 31	7504	−37	268	+8	37	48	4	F	Do.
		7502	−10	295	+5	10	48	1		
				(305)	(+5)	.....	96	5		

POSITIONS, AREAS, AND COUNTS OF SUNSPOTS FOR OCTOBER 1942—Continued

Date	Eastern standard time	Mount Wilson group No.	Heliographic				Area of spot or group	Spot count	Plate quality	Observatory
			Difference in longitude	Longitude	Latitude	Distance from center of disk				
1942	*h m*		°	°	°	°				
Oct. 24...	11 1	7504	−25	269	+9	26	24	3	F	U. S. Naval.
		7502	+2	296	+5	2	24	4		
		7503	+21	315	−3	23	12	3		
				(294)	(+5)	.....	60	10		
Oct. 25...	12 21	7505	−38	242	−5	40	73	4	F	Mt. Wilson.
				(280)	(+5)	.....	73	4		
Oct. 26...	12 35	7505	−27	240	−7	30	48	6	F	Do.
		7505	−22	245	−7	26	73	4		
		7506	+33	300	−4	35	48	1		
				(267)	(+5)	.....	169	11		
Oct. 27...	10 53	7508	−85	170	−9	85	194	1	G	U. S. Naval.
		7507	−77	178	−14	78	242	1		
		7505	−12	243	−8	17	145	17		
				(255)	(+5)	.....	581	19		
Oct. 28...	10 25	7509	−78	164	+8	78	97	4	G	Do.
		7508	−70	172	−9	71	291	3		
		7507	−63	179	−14	64	218	1		
		7508	−61	181	−7	62	48	1		
		7505	+1	243	−8	13	145	19		
				(242)	(+5)	.....	799	28		
Oct. 29...	10 51	7509	−64	164	+8	64	48	2	G	Do.
		7508	−57	171	−9	58	291	12		
		7507	−49	179	−13	52	218	1		
		7508	−48	180	−7	50	48	3		
		7505	+15	243	−7	18	145	17		
				(228)	(+5)	.....	750	35		
Oct. 30...	11 31	7510	−70	145	−12	71	24	1	G	Do.
		7509	−49	166	+8	49	24	1		
		7508	−43	172	−10	46	339	16		
		7507	−36	179	−12	39	242	1		
		7505	+29	244	−7	33	97	10		
				(215)	(+5)	.....	726	29		
Oct. 31...	10 23	7510	−58	144	−12	60	24	1	G	Do.
		7509	−36	166	+7	37	12	1		
		7508	−30	172	−10	33	388	9		
		7508	−26	176	−11	30	97	9		
		7507	−22	180	−12	28	242	1		
		7505	+47	249	−7	49	48	2		
				(202)	(+4)	.....	811	23		

Mean daily area for 30 days=272

* Not numbered.
† Data for October 16 taken from Mount Wilson chart.
VG=very good; G=good; F=fair; P=poor.

Chart I. Departure (°F.) of the Mean Temperature from the Normal, and Wind Roses for Selected Stations, October 1942

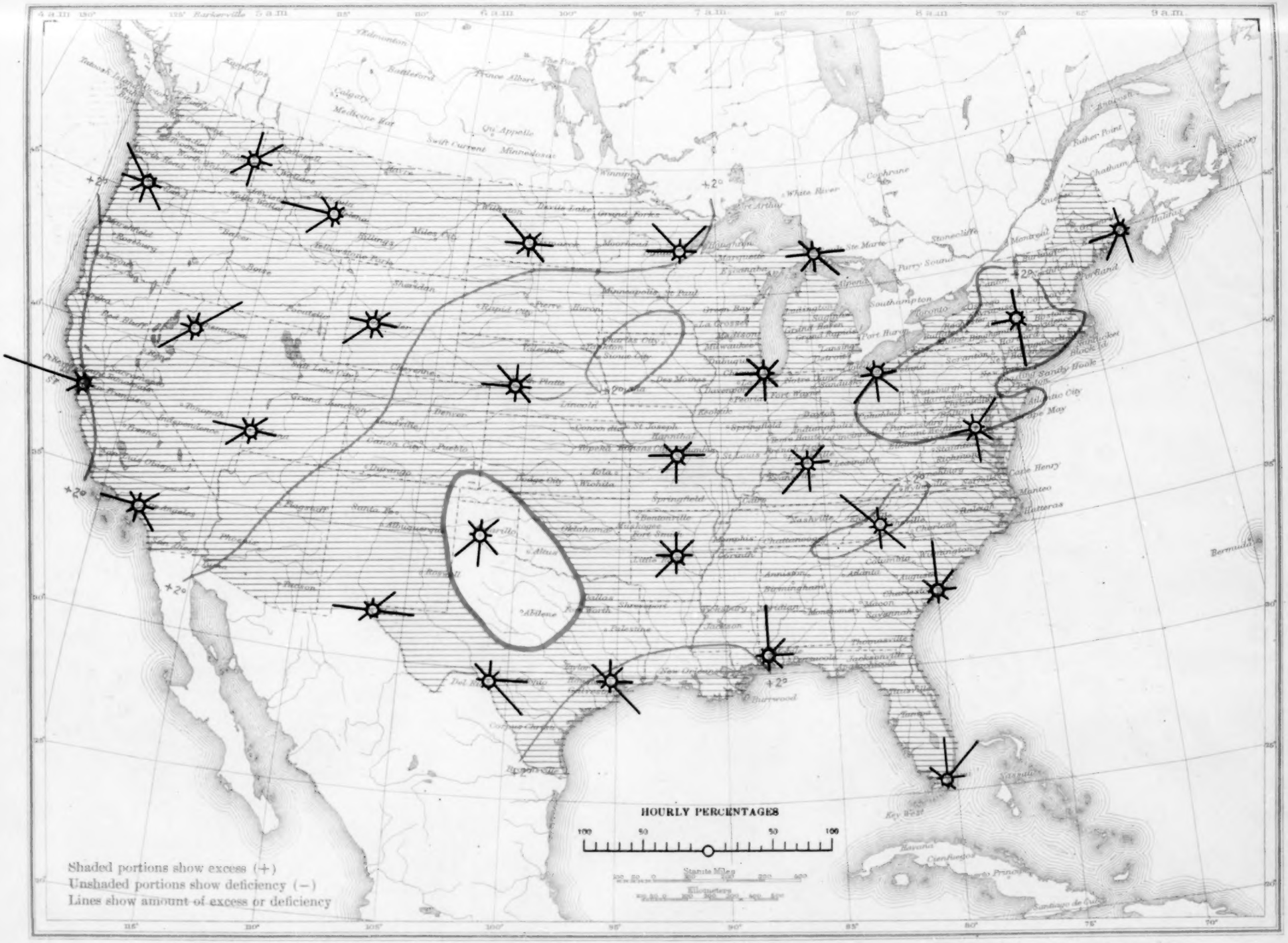
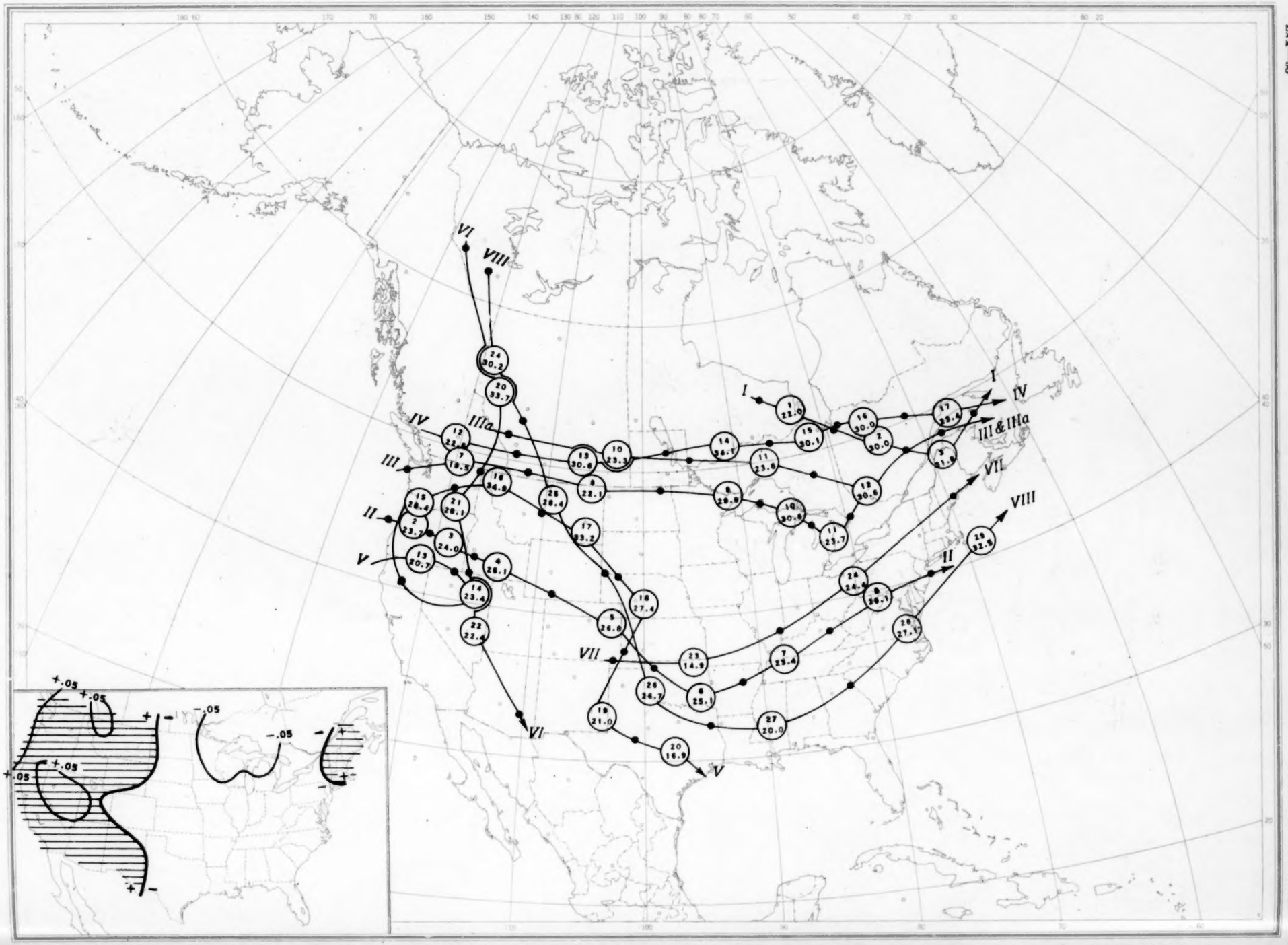


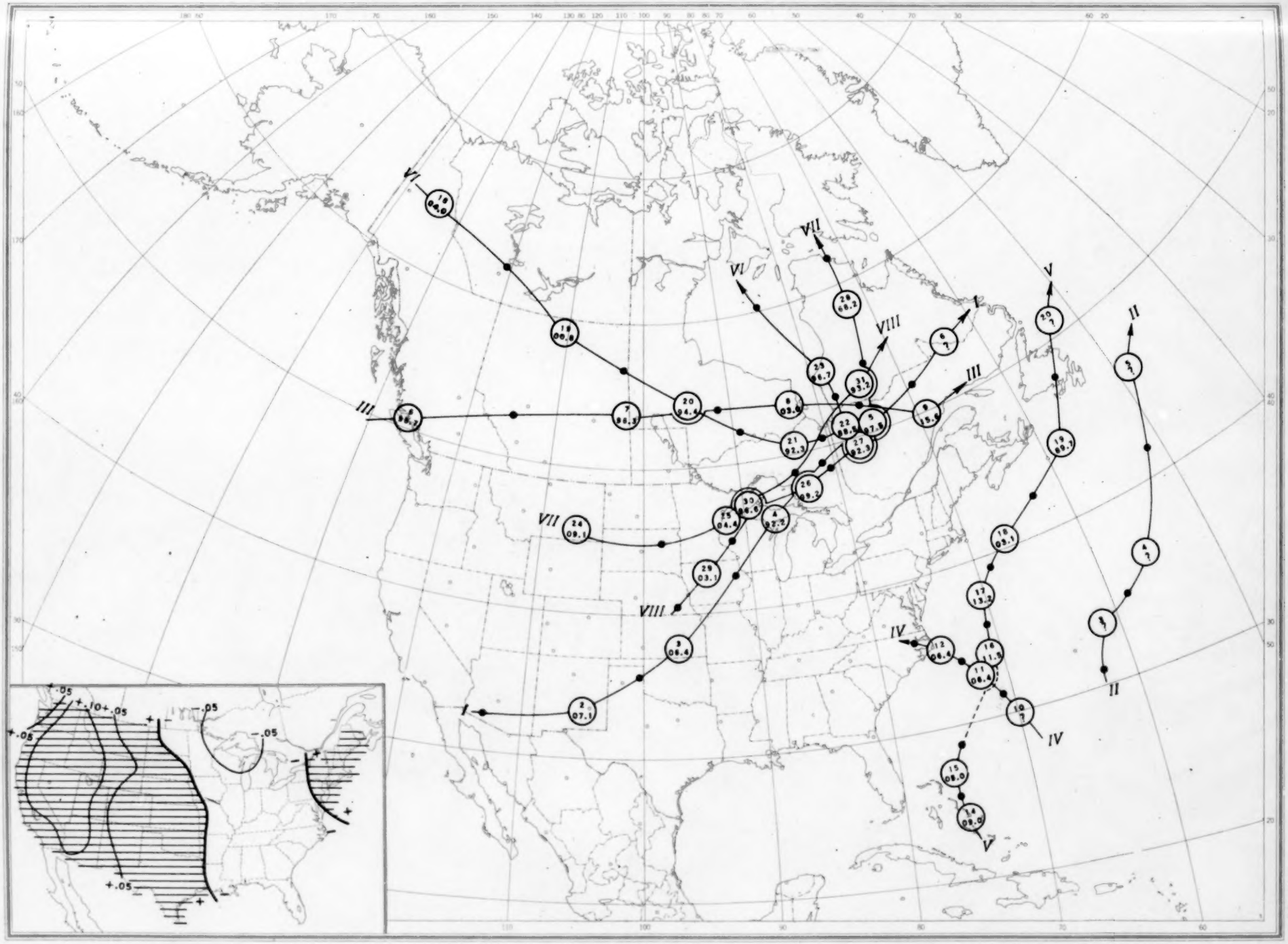
Chart II. Tracks of Centers of Anticyclones, October 1942. (Inset) **Departure of Monthly Mean Pressure from Normal**



Circle indicates position of anticyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of anticyclone at 7:30 p. m. (75th meridian time).

Circle indicates position of anticyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of anticyclone at 7:30 p. m. (75th meridian time).

Chart III. Tracks of Centers of Cyclones, October 1942. (Inset) Change in Mean Pressure from Preceding Month



Circle indicates position of cyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of cyclone at 7:30 p. m. (75th meridian time).

Chart IV. Percentage of Clear Sky Between Sunrise and Sunset, October 1942

Chart V. Total Precipitation, Inches, October 1942. (Inset) **Departure of Precipitation from Normal**

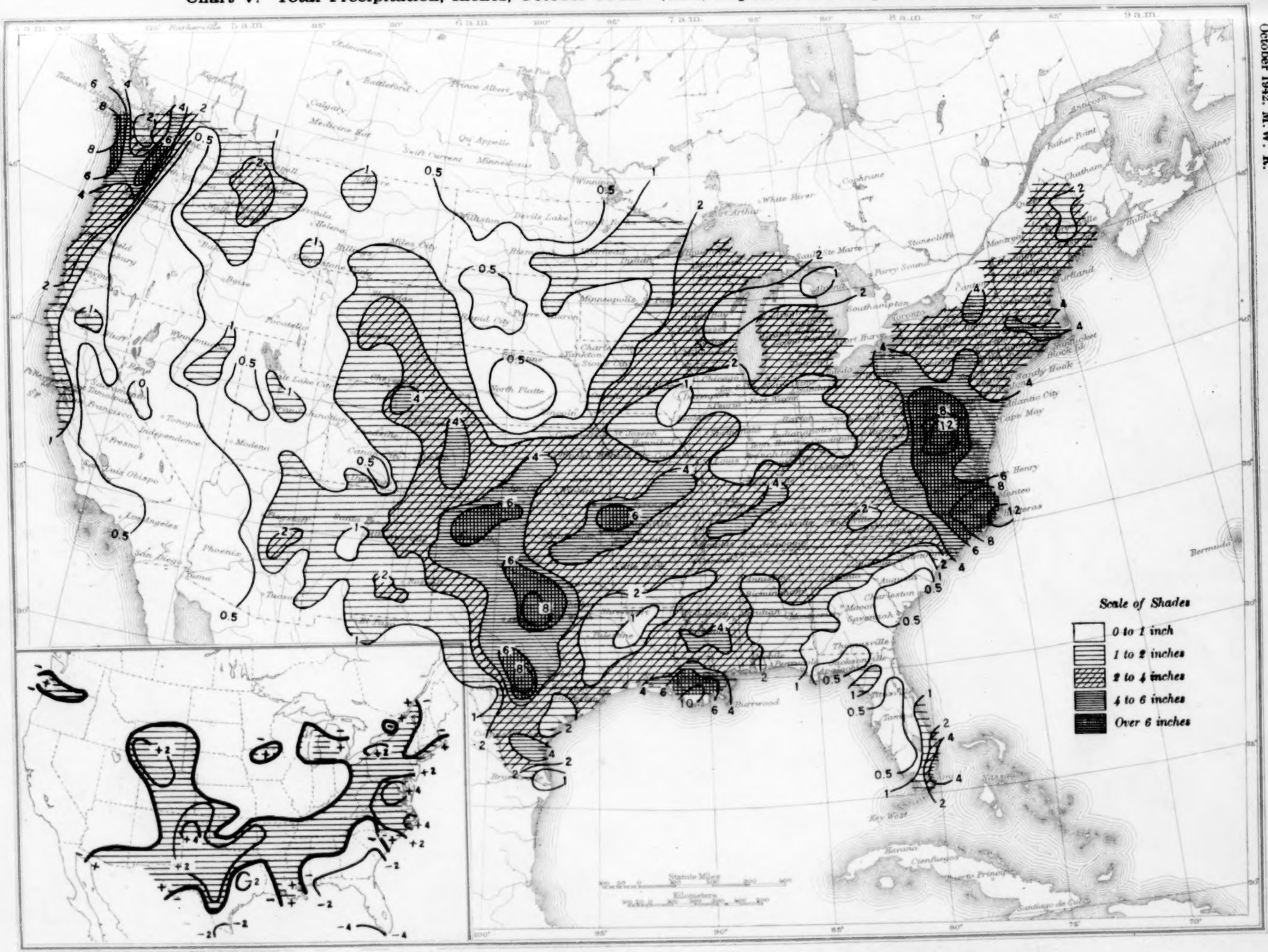


Chart VI. Isobars at Sea Level and Isotherms at Surface; Prevailing Winds, October 1942

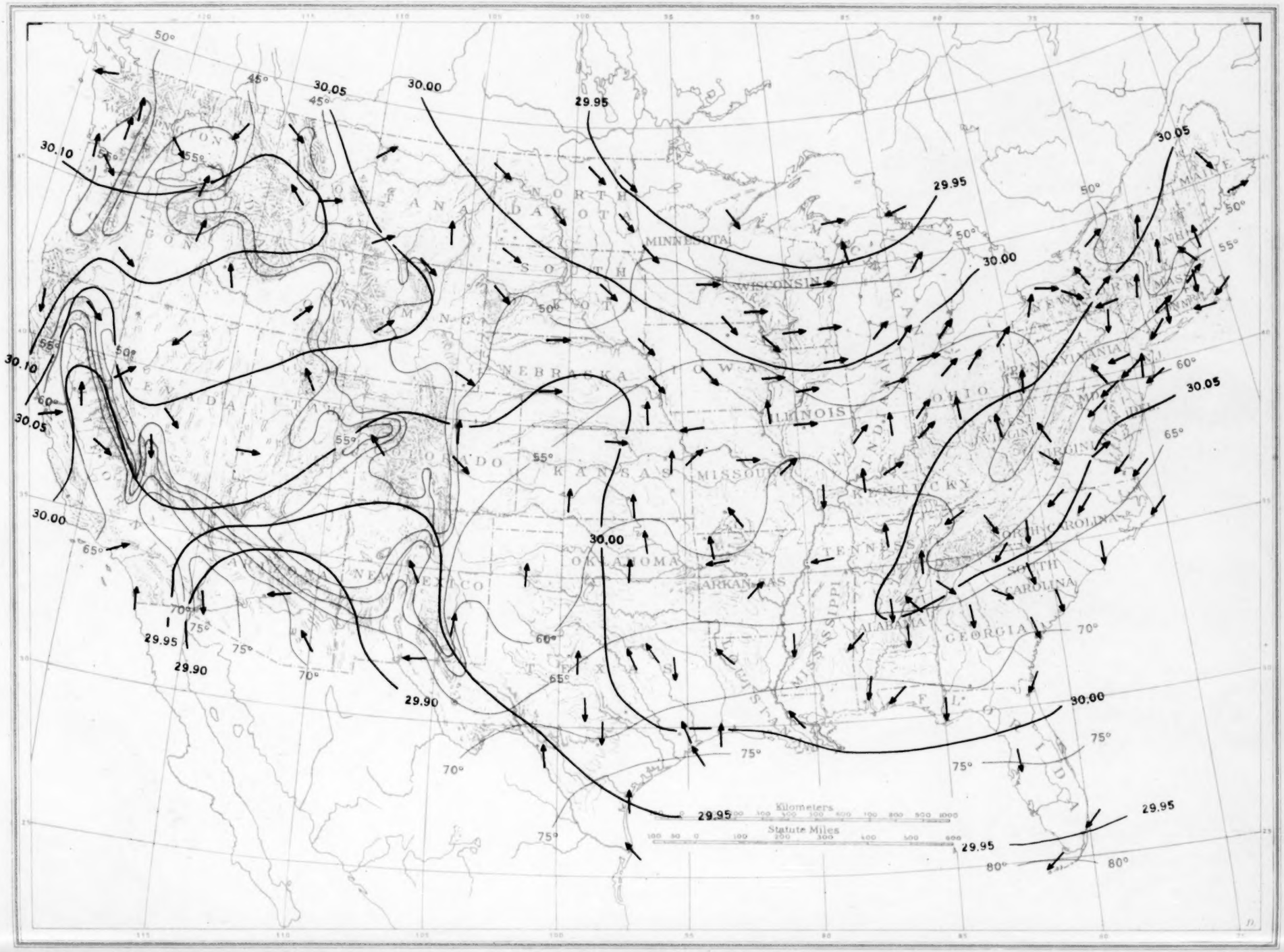


Chart VIII. Isobars (mb) for 1,524 Meters (5,000 ft.) and Isotherms (°C.) and Resultant Winds for 1,500 Meters (m. s. l.) October 1942

Isobars and isotherms based on radiosonde observations at 11:00 p. m. (E. S. T.) and winds based on pilot-balloon observations at 5:00 a. m. (E. S. T.).

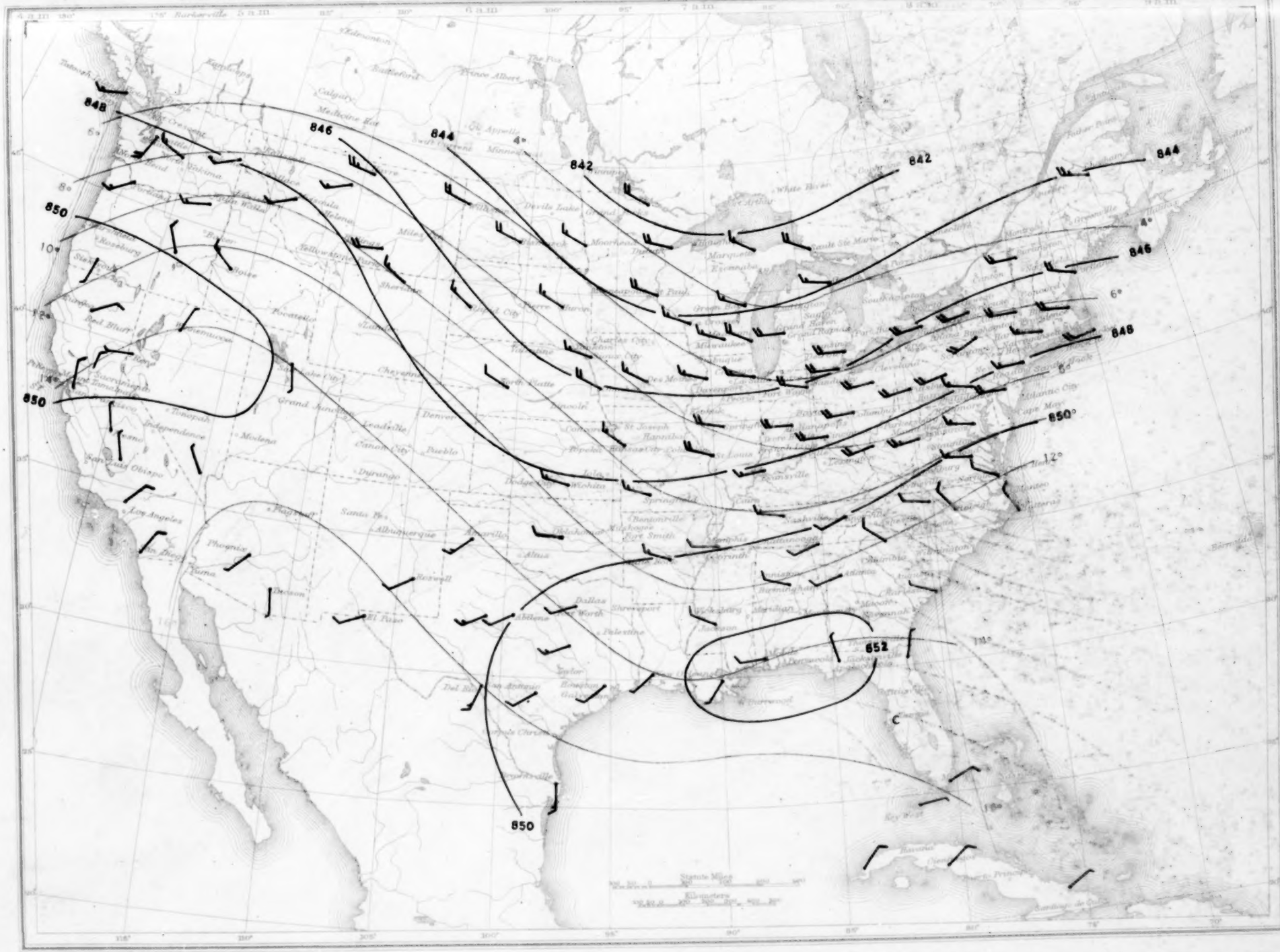


Chart IX. Isobars (mb) Isotherms (°C.) 11:00 p.m. (E.S.T) and Resultant Winds 5:00 a.m. (E.S.T.) for 3,000 Meters (m.s.l.) October 1942

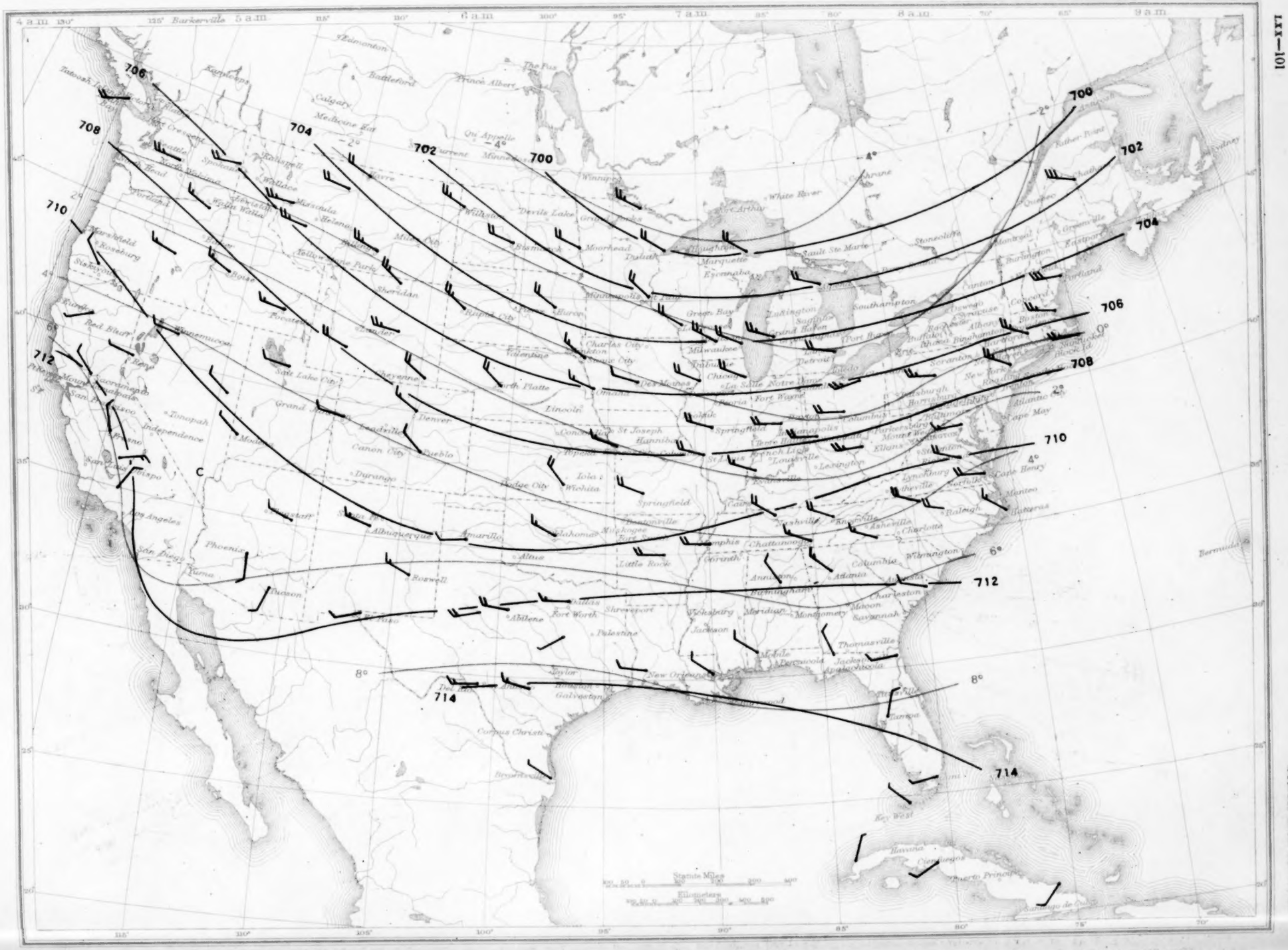


Chart X. Isobars (mb) Isotherms (°C.) 11:00 p.m. (E.S.T.) and Resultant Winds 5:00 p.m. (E.S.T.) for 5,000 Meters (m.s.l.) October 1942

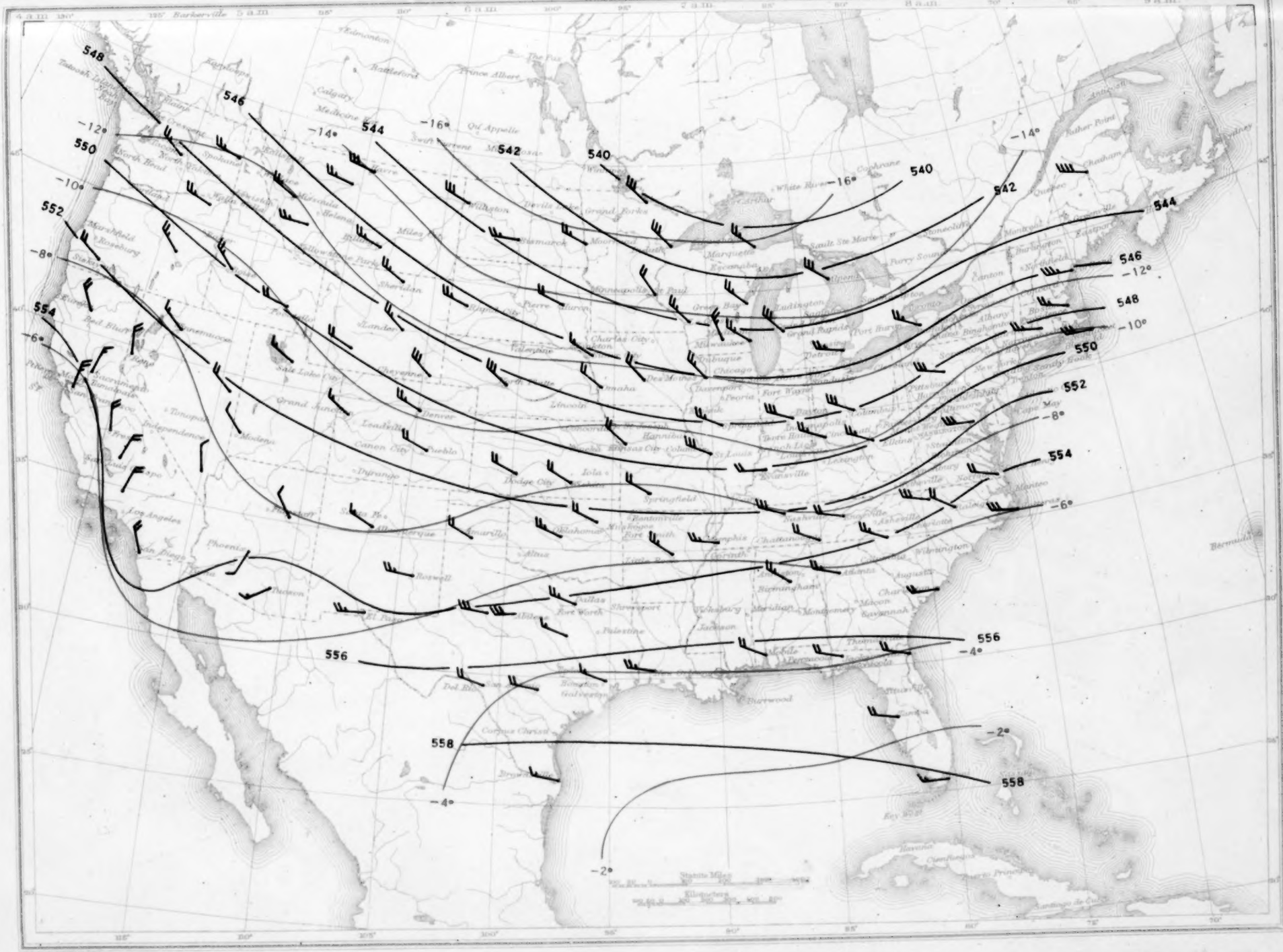
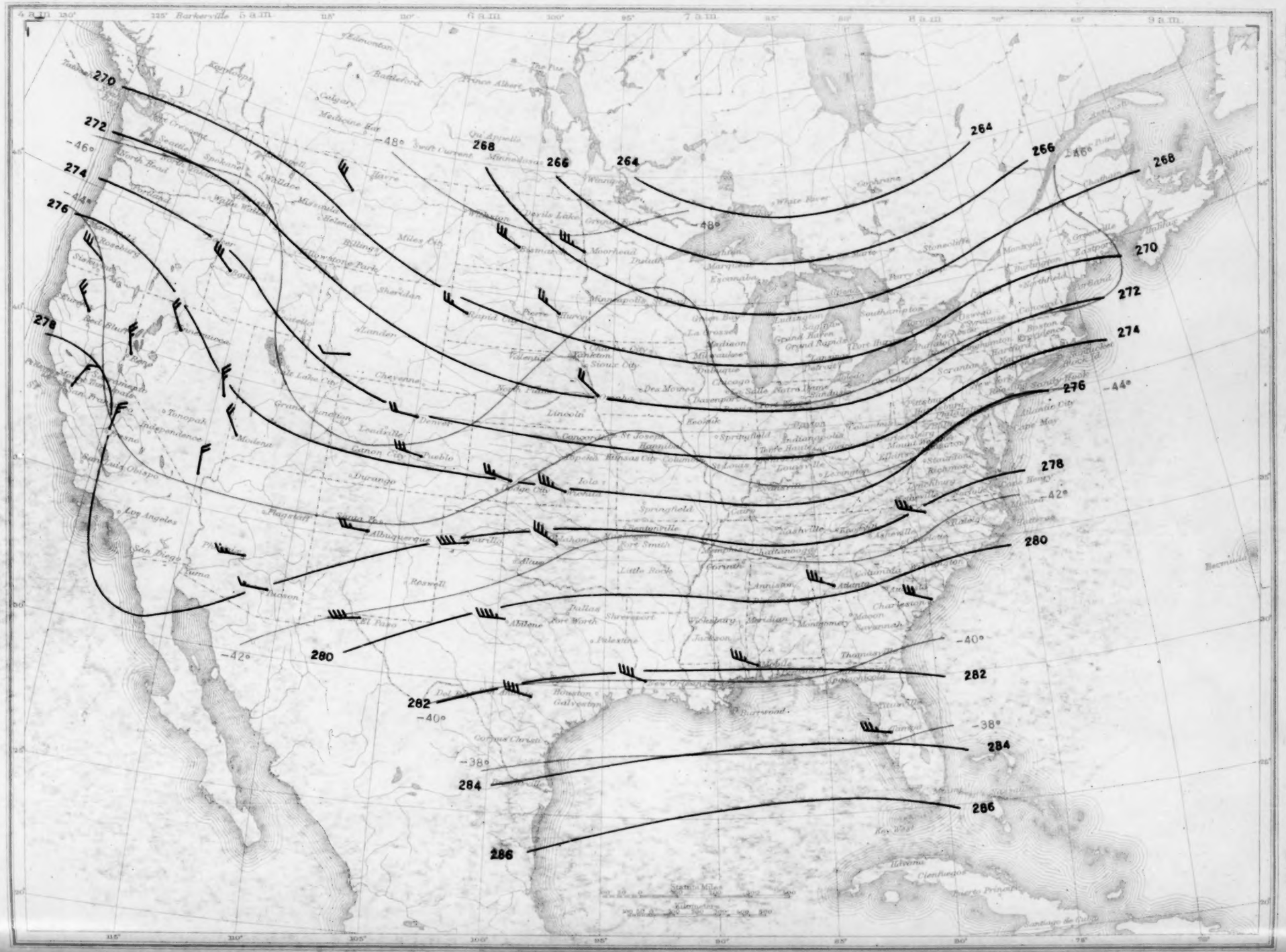



Chart XI. Isobars (mb) Isotherms (°C.) 11:00 p.m. (E.S.T.) and Resultant Winds 5:00 p.m. (E.S.T.) for 10,000 Meters (m.s.l.) October 1942